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U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOURTH ANNUAL REPORT

SEASON OF 1914

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PRIEST RIVER EXPERIMENT STATION

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by

Donald R. Brewster

Forest Examiner in Charge.

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December 9, 1914

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FOURTH ANNUAL REPORT OF THE PINE RIVER EXPERIMENT STATION

SEASON OF 1914

PART I

ADMINISTRATION

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1. GENERAL

This report marks the completion of the third growing season since the establishment of the Station. The force has had the benefit of experience gained in the two previous seasons and the quality of the work and the standard and volume of results accomplished have been correspondingly greater than in past years. Various changes for the better have been made in the organization which will add to its efficiency and the outlook for accomplishing more and better work in 1915 is very good.

As in the 1913 report, it has been thought best to divide this report into two distinct sections, one dealing with the work and problems of the station from an administrative standpoint, including a general discussion of the investigative work, and the other (part II) taking up each investigative project in detail for the purpose of making a concise progress report on the work to the District Investigative Committee, sufficiently detailed to give some basis for an understanding of the project and intelligent action on it by the Committee. These project reports are in exactly the same form as specified for the District Committee's report to the Forester, so that, in case no change is made by the Committee, the report can be

merely copied for inclusion in the Committee's report. The individual project reports were completed early in December and submitted to the different members of the District Committee several days in advance of the meeting held on December 12 so that they would have time to familiarize themselves with the contents beforehand.

2. ORGANIZATION

The principal change made in organization has been the substitution of a Forest Clerk for one of the three technical men of the force. The scheme outlined in the 1913 report, by which it was proposed to divide up the clerical work among the three technical men did not work out as expected, since one man spent the entire summer at the Savenac Nursery, another was busy with routine investigative work, and it was left to the Director of the Station to handle practically all correspondence, accounts, filing, and other work of a similar nature which had to be done currently whether anything else was done or not. The considerable amount of improvement work during the summer created an exceptionally large amount of accounts work, ordering of supplies, preparation of vouchers, etc., and the time required for this formed a considerable proportion of the entire time of the Director during the summer, cutting down appreciably the amount of investigative work done.

As soon as it was seen how this system was working out, steps were taken in July to secure the transfer of an experienced clerk from some Forest. This was not possible until after the

fire season was over but in the middle of October Forest Clerk Lee Stratton who had been assigned to the Beartooth Forest for over four years, was transferred permanently to the Experiment Station as Clerk and general administrative assistant. During the next season, the organization will consist of the Director, who will put in the greater part of his time on the detailed investigative work; a technical assistant specializing in forestation problems who will spend the summer at the Savenac Nursery and on field planting studies throughout the District; the Clerk who will handle all clerical work of either an administrative or investigative character, take charge of the details of improvement work and administrative matters connected with maintenance, fire protection, etc., and help with routine investigative work in spare time; one or two temporary student assistants to help in making counts, establishing plots and other field work; and a handy man who will have charge of improvement crews and carry on the various kinds of outside activities connected with running the Station.

3. STATION TERRITORY

In the reconnaissance work carried on by a two-man crew from January to April, 1914, a little more than half of the total Station territory was completed, including the whole of sections 25 and 26 and whatever parts of sections 27, 34, and 23 were included within the boundaries. Two men have been assigned to the work from November 6 to December 9, 1914 and have completed Section 30 and one-eighth of Section 24, in addition to

the vertical control around Sections 24 and 19. No more work can be done in 1914 but it is hoped that it will be possible to detail two men to finish sections 24 and 19 some time in the late winter and spring. Thirty miles of line remain to be run which will require from a month to a month and a half according to the weather. Assignment of two men from March 15 to April 30 should be sufficient for completion. The two remaining sections are covered largely with 50-year-old cedar, hemlock and fir with more or less alder and other underbrush. This is very difficult country to work during the winter months when snow is deep. It is all side camp work, four or five miles from the Station and attempting to do the work in January and February would run the cost up considerably and secure a poorer grade of work. It would be entirely possible to do the work on snow shoes at this time, however, if there are men available for the purpose.

A special effort should be made to induce the State of Idaho to accept other land in lieu of their selections on the head waters of Denton Creek and the South Fork of East River before these selections go to patent, thus completing the two watersheds which compose the Experiment Station management unit. It is understood that action to this end is being taken at the present time. If this can be arranged the reconnaissance can very conveniently be extended to the balance of the watersheds at the time sections 24 and 19 are being done, thus completing the entire area in preparation for making a working plan, and it is suggested that a four-man crew be assigned to the reconnaissance work in 1915, preferably in the spring or summer, so

that the entire project can be completed in an economical and efficient manner, obviating the necessity of extending the work over several winters with a two-man crew.

During the winter of 1913-14, four small timber sales were made to neighboring ranchers, including approximately \$110.00 worth of fire-killed white pine and larch saw timber and \$23.00 worth of dead cedar fence posts. This material was taken from a burned seed plot on the Jurgens sale area and scattered trees along the roads and resulted in a noticeable improvement of the appearance of the timber as well as the utilization of material which otherwise would have gone to waste. It is probable that several more small sales of this character can be made during the coming winter and an effort will be made in this way to clean up and improve the more accessible parts of the timbered area.

The project of giving the Experiment Station a small administrative unit of timber land to manage has led to a further and very interesting possibility suggested by Mr. Greeley and Mr. Mason during their visit to the Station in the fall of 1913 and discussed further during the visit of Mr. Silcox and Mr. Mason in November, 1914. This contemplates the assignment to the Station during some of the winter months of a small number of Rangers from the various Western Montana and Idaho Forests. For many of these men, the Service work is practically at a standstill during the months when snow is too deep to allow of much outdoor work,-- January, February, and March,-- especially in years such as the present when timber sale business is very slack.

Supervisors frequently have trouble finding work for these men at this period of the year and yet it is essential that they be kept as year-long men for the improvement and fire-protective work in the summer.

The plan, is then, to choose a few men from several of the western Forests and assign them to the Station, together with a Supervisor or other Officer capable of directing their work, during these slack months. While at the Station, they can be given a number of different classes of work to do which will help to develop the area and put it on an intensive management basis and will, at the same time, broaden the view point of the men and give them excellent instruction and experience under a competent instructor.

The project of developing the Experiment Station area intensively so that it will serve as a working ground for experiments is an excellent one but it will be a very slow process if dependence must be made on the present allotments. The bulk of the funds must of course be devoted to the current investigative work for which the allotment is made so that very little will be available for the development project. On the other hand, the assignment of from ten to twenty men from different Forests to the Station for three months each winter would make available from two to four thousand dollars worth of labor which could be applied to the work of making the area an ideal forest. Valuable time which would otherwise be partially or wholly lost to the Service would thus be applied on a very desirable and productive project.

With this labor available the possibilities of carrying on experiments on thinnings, brush disposal, methods of cutting, etc., will be greatly increased, and it will be possible to extend the trails, improve the fire protective system, make improvement cuttings, and develop the tract into an ideal forest in every way. Such ideal development will not be possible on the large National Forest tracts for many years and the value of having this small tract operated in connection with the Experiment Station to serve as a model on which various methods and systems of intensive forestry can be tried out at small cost in advance of general application is apparent.

The possibilities of advertising Forest Service activities and aims by developing this model forest tract are large. By opening up the area with trails and roads and establishing all the various experiments which will be desirable in connection with intensive development, a more or less complete idea of practical forestry as the Service would like to practice it under carefully controlled conditions could be obtained by a casual visitor. Hunting and fishing in the vicinity are excellent and would be additional inducements. The area is so comparatively accessible from railroads and large population centers, and everything to be seen would be within such a small compass, that a minimum of time and trouble would be involved in visiting it.

There are some very easy and attractive trips to splendid view-points on the area, and it is believed that large numbers of people from Spokane and other points, seeking re-

creation in the form of hunting, fishing, and mountain climbing, would be glad to visit the Station during the summer and fall.

Some provision would of course be necessary making it possible for tourists to obtain board and lodging. This is already needed in connection with running the Station itself for taking care of visitors, single men of the force, and to some extent the married members of the force and their families. Such provision could be made if the plan is followed of having the Rangers obtain the use of a portable saw mill and use the lumber for the erection of an inexpensive quarters for themselves during their winter assignment. These quarters would not be in use during the summer and it is thought that some elderly couple can be obtained who will be glad to use the buildings to furnish board and lodging to tourists and visitors to the Station in the summer and board to the Rangers during the winter assignment and to the Station force throughout the year. A comfortable living could be obtained in this way by the right people and special inducements in the shape of use of land for a garden, pasture for cow, temporary work on planting, improvements, and fire-protection, etc., could be given. Such an arrangement would be of great benefit to the Station.

The most important present problem in connection with the Station territory is fire-protection. The expenditure of much time and money on experiments and intensive development of such a tract will not be justified unless the best possible security against fire can be given. Considerable time and atten-

tion was given to trails and telephone building during the past summer for this reason, although the investigative work was cut down in consequence. A special fire patrolman was on lookout and highland patrol duty in August and September and did good work.

It is desirable that sufficient funds be provided during the next year or two to complete a trail along the south ridge of Benton Creek. Most of the danger from outside the area is from this direction and this ridge is the logical location for stopping such fires. There are two saddles where fires are particularly liable to be drawn over the ridge and these should be protected with a permanent system of cleared fire-lines. Such lines would constitute an interesting and valuable experiment in intensive protection and would undoubtedly be an important help in protecting the Station, in case of threatening fires. The watersheds north and south of the Station are under State control and owing to a poor organization and lack of funds the State is unable to give this territory any adequate fire protection. Consequently the problem of protecting the Station involves constant watch of considerable territory to the north and south from which fires which might easily get beyond control of the State force might come.

The fire protective force and equipment at the Station should be complete enough and mobile enough to allow of giving quick aid to the State in putting out small fires to the

North and south of the area. As a preparation for this, a complete outfit of tools, cooking equipment and non-perishable provisions for ten men was purchased toward the end of the 1914 fire-season and will be kept stored in lockers for immediate use at any time.

The carrying on of a certain amount of trail building and other improvement work from July 15 into September should be definitely planned for each year in order that a small crew of men will be within close call for protective purposes at any time. Obtaining men from Priest River is an uncertain matter which is liable to consume a day or two and it is not possible to depend upon the neighboring ranchers for much help. The value of such a force was demonstrated during the past summer when our improvement crew, equipped with Station tools and hauled by the Station team, was put on two threatening slash fires soon after they started and many hours before it would have been possible to get men from town, making it possible to control the fires very easily and cheaply.

Provision should be made for a fire patrolman from July to September in 1915 and annually thereafter, who can do lookout duty and help on improvement work during wet periods.

4. IMPROVEMENTS

During 1914 the improvement work was confined largely to out-of-door projects. The six-acre slashing around the Station buildings was burned and the material left unburned was

re-piled and burned. A large part of the stumps were pulled by teams and from the portion between the laboratory and the dwellings, which had been cut close to the ground in 1912, all stumps were removed by blasting. The larger stumps which could not be pulled by team (a small proportion) were left on most of the area to remain for a few years to rot loose so that they could be pulled easily. In the meantime the ground will be harrowed and sown to clover and pasture grasses which aid greatly in the root-rotting process and will furnish considerable summer pasture.

The area of improved meadow was increased from 2 to 4½ acres, upon which a crop of oat hay was raised. This ground was plowed this fall and will be sown in the spring to permanent clover and timothy hay, mixed with oats for a nurse crop. It will remain in hay for three more years and then be renewed by sowing to oats and grass again. About two additional acres of alder bottom have been slashed and the slash piled. This will be burned and cleared, if possible, in the spring, and sown to oats.

The slashing along the road from the Station to the stage road was burned in the spring and the unburned material cut and piled. This will be burned in the coming spring and it is hoped to be able to stump the strip and grade up a well-drained roadway during the coming season.

For the purpose of opening up the Benton Creek watershed for fire-protection and administration, a start was made

toward the construction of a logging road up the creek in the shape of a slashing wide enough for a road and about 3-1/4 miles long. One mile of this slashing, from the laboratory up the creek, was stumped and cleared about five feet wide for use in hauling supplies up to the camp in a stone boat. An additional 1-1/4 miles on up the creek was improved by grading a good trail tread. The last 1/2 mile to the head of the slashing was not graded nor logged. The upper mile and a quarter is on a 15 percent grade, the grade below that ranging from 1 to 6 percent.

The head of the road slashing is well within section 30, the last section on the Benton Creek drainage, and on account of the rapid fall of the creek above that point, it will not be desirable to extend the road much, if any, farther. The upper end should be logged and graded and a trail connecting it with the projected trail along the south ridge and and thus around to the spring and the lookout station should be built during the coming summer. Between the Station and the stage road, a strip about 3/4 mile long has been slashed out wide enough for a logging road along the south side of the Creek and the slash piled ready for burning. This will be burned in the spring and during the summer this piece should be improved sufficiently to make a winter hauling road for the removal of scattered timber along the lower part of the Creek. This will involve logging, stumping, corduroying and grading on different parts.

A new trail, called the Cut-off Trail, on a 13 to 15 percent grade and 1-3/4 miles long, was built to connect the road trail along the creek at a point about a mile above the Station, with the old trail along the north ridge, known as the Bald Mountain Trail, and to furnish a more direct route for the telephone line to the lookout point. Water, in the shape of a spring, was discovered at 4900 feet not far below the rock slide where the two ridges forming Benton Creek drainage meet. In order to make use of this water a level trail 1/2 mile long was cut and graded, leading from the Bald Mountain Trail to it. It is planned to eventually make this spring a junction point of trails leading up both the north and south ridges of the drainage. From the spring a single trail will lead on up to the lookout point two or three miles further on the main range.

A telephone line 6 1/2 miles long was constructed from the Station up the Creek for a mile, then up the new Cut-Off Trail and along the north ridge to the lookout point on the range. It has been suggested that this telephone line be extended 1 1/2 miles further to the main Bald Mt. peak from which an extended view can be obtained over a large part of the Kaniksu and Pend'-O'Reille Forests. This would serve to protect the Station as well as the present point and would in addition, furnish a valuable triangulation point for the other lookout stations on these Forests. This was one of the points chosen for use in experimenting with heliographs in 1909.

Of the additional trails needed, the most important is one which will open up the South Fork drainage and make it more easily accessible for the remaining reconnaissance work. This trail will start from the 3300-foot contour on the Cut-Off Trail and run on a 3 percent grade for about a mile, striking the South Fork about on the line between sections 19 and 20 at a desirable point for a reconnaissance camp.

Another trail which is needed is one which will connect the Station with the lower part of the South Fork drainage in sections 23 and 24, joining the above-mentioned 3 percent trail down from the ridge at the east line of section 19 and continuing on up the South Fork in section 20 and above, in case the headwaters are added to the Station area.

On Benton Creek drainage, a trail $1\frac{1}{2}$ mile long is needed up to the crest of the hill south of the Station to connect with a meteorological station to be established there next spring or summer. Eventually a trail should be built more or less along the ridge south of Benton Creek and swinging around to the spring at the head of the Creek. For the first $1\frac{1}{2}$ miles, this trail can hold a 10 percent grade along the northerly slope to a saddle near the line between sections 25 and 26. This trail will be a low enough grade so that it can later be widened into a skid or dray road or even into a sleigh road for taking out the north slope timber of which there is quite a large quantity along the upper slope which would be accessible in no other

way. From the saddle on up to the spring a 15 percent grade can be followed. The total length of this trail will be about $4\frac{1}{2}$ miles. A 15 percent connecting trail from the saddle down to the Creek road would be only about $\frac{1}{4}$ mile long in a north-east direction and could be built in place of the $1\frac{1}{2}$ miles of 10 percent trail for the present as it would make the upper south ridge accessible at a much smaller cost. The entire trail should be built as soon as possible, however, as an urgent fire protective measure.

Lumber has been purchased and hauled for a shed to be used for protection of wagons and farming implements and on the second floor for a store house for fire tools and improvement equipment. Such a building is badly needed to keep the equipment from deteriorating and getting lost and it is hoped to be able to build it this winter with the help of the Rangers who are to be assigned.

During the summer, a painter was hired to paint the laboratory and barn and parts of Cottage No. 2. The appearance of these buildings has been greatly improved as shown in the accompanying prints and their lasting qualities have been increased. Paint is on hand for use on the Benton Ranger Station and will be put on in 1915.

5. EQUIPMENT

A Thatcher calculating instrument has been transferred from the Washington Office which has saved a great deal of time

and work in the large amount of multiplying and dividing necessary in tabulating and computing our investigative data.

A Klaussner hypsometer, an 8-inch Swedish increment borer and a high grade analytical balance have been purchased as additions to the Station equipment.

The Supervisor of the Kanikau has transferred to the Station a draft horse of medium weight, which has been of no use in road work because of contraction of the hoofs but which is very useful about the Station in skidding logs, pulling stumps, clearing alders, plowing, and other work of a similar nature, and pays the cost of maintenance several times over during the year. One of the horses in the driving team died in March and was replaced by a new one which was a better match in every way for the remaining horse. The team has been very useful during the summer in hauling supplies and lumber from town, in plowing, etc.

6. ACCOUNTS AND RECORDS

On account of the change in classification of the Forestation projects from a class-of-work to a species basis, a change in the cost-keeping system was made necessary at the beginning of the Fiscal Year. In order to tie the two methods in for the investigative year it was necessary to keep costs during the last half year for both species and class-of-work. From now on this will be unnecessary, since it is thought that the purposes of the cost-keeping work will be fully served by

merely keeping costs on main projects classified by species. Thus for the coming investigative year, from December 1, 1914 to November 30, 1915, costs will be kept only for such projects as "Western Larch Seed Studies", "Douglas Fir Nursery Practice" or "Western White Pine Sowing and Planting", and no attempt will be made to record separately each line of work under these projects, as previously done.

It is planned as soon as possible to reduce all of the accumulated investigative data on hand to tables and computations which can be typewritten or copied in such a way that one copy can be sent to the District Office for filing. This is desirable because of the considerable danger to the laboratory from fire which would destroy at the present time a very large amount of valuable data which could not be replaced. An opportunity will be presented for doing this in connection with the preparation of detailed progress reports on many of the projects this winter.

7. INVESTIGATIVE PROGRESS

A large proportion of the investigative work during the past year has been on the forestation projects. Our program has always been more ambitious along this line than the men and facilities really warranted. In an attempt to cover the listed problems fully enough to justify drawing conclusions so that most of this work could be dropped as soon as possible and more time put on the management projects, it was found

necessary to devote a major part of the summer to seed, nursery, and planting projects, and a minor part to the management projects which are admitted to be of more importance. It is felt, however, that by this concentration, a great deal of progress has been made and most of the forestation projects have been brought much nearer completion than they were a year ago.

a. Seed Studies. The most important of these is the one on comparative germination in the greenhouse test and in nursery sowing. This study was carried on with western yellow pine, western white pine, western larch and Douglas fir jointly at the four different nurseries of the District. The results with yellow pine were very close to those of 1913 and show that a solution of this problem is both possible and of great value in nursery work. Information on the other species was also of value. In attempting to find methods of stimulating western white pine germination some favorable indications were found in using an incubator for treating the seed between rolls of moist flannel at 90 degrees F. This will be followed up during the coming year with a complete series of experiments.

b. Nursery Practice. Forest Assistant E. C. Rogers, the member of the force who is specializing on forestation problems, spent most of the season at the Savenac Nursery conducting a number of experiments on a scale large enough to give conclusive results. Many of these will have to run for several years

before conclusions can be drawn but much important information was obtained during the first season which will be a guide to the nurserymen on the amount of seed to sow per bed, season to sow, depth of covering seed, method of sowing, the best fertilizers to use, the degree of shading needed and the best time to apply shade, the time of transplanting, and the desirability of heeling in or storing plants for late planting on high north slopes or for other purposes. Most of the work was with western white pine, the most important species at the nursery and the one about which least is probably known. Considerable work with western yellow pine was also done and some with western larch.

At the Experiment Station, considerable intensive nursery work resulted in obtaining further information on germination, survival and development of seedlings sown at different times and under different conditions of shade and moisture. Stimulation of white pine germination, shading of yellow pine, larch and Douglas fir, and watering of yellow pine and larch were the main lines of nursery practice work. At the Trapper Creek Nursery Forest Examiner Silva conducted experiments on comparative germination and on season of sowing of western yellow pine with good results.

c. Sowing and Planting. Several hundred plots at the Experiment Station were counted in the spring and fall and some extensive experiments of western yellow pine, western white pine

and other species were installed. A 7-acre experimental plantation of eastern white pine and Norway spruce was established. Important information was obtained on the grading of white pine and yellow pine stock into large, medium and small, which indicated that the culling of more or less of the smallest plants will probably pay. Excellent comparisons between fall and spring planting of yellow pine and white pine were obtained, showing greater success from spring work. A comparison between favorable and unfavorable sites for white pine planting in a dry year gave conclusive results, giving a 98 percent success on a northeast slope, 75 percent success on a sandy flat and a total failure on west, southwest and southeast slopes.

Plots installed in 1913 and 1914 have contained from 200 to 400 plants thus giving more dependable results than previously obtained from plots containing only 100 plants. Spring sowing of western white pine has shown much better results than fall sowing at the end of the second season, and sowing in prepared spots has been the only successful method of sowing used with any species. Seedling planting stock of white pine, yellow pine and larch, two or three years old, continues to hold its own with transplant stock in survival and growth and to have a uniform lead in a comparison based on cost per surviving plant. Tests of various conifers and hardwoods not native to the region were continued.

Forest Assistant Rogers directed and put in considerable time during the summer on an intensive study of old planta-

tions which was carried on jointly by the Experiment Station and the Office of Planting. The aim of this study was to determine very exactly what success had been secured on various sites with different species and different classes of stock on plantations two years of age or older. The method employed was a careful strip reconnaissance. Much valuable data was obtained which is now being worked up by the Office of Planting. A detailed report of the work and results will be included in the annual planting report for the District.

The responsibility for conducting the large scale planting experiments on the Placer Creek area on the Coeur d'Alene Forest was given to Rogers and during the summer he directed the work of opening up the middle fork of the creek by trail and of staking and partially counting the several acres of planting experiments installed in the spring of 1913. In the fall of 1914 he installed eight plots containing several hundred plants each in a study of age classes of western white pine and western yellow pine. In addition, he prepared working plans during the summer for extensive experimental planting work on the Placer Creek area.

d. Methods of Cutting: A permanent sample plot of one acre was established on a selection cutting in the white pine type on the Coeur d'Alene Forest. Preliminary trips of observation were made on the Blackfoot and Deerledge Forests preparatory to locating various management studies in the larch-Douglas

fir and lodgepole pine types. An extensive experiment was installed in the fall for determining the length of time western white pine seed will survive in the soil and duff of the forest floor, under different conditions of light and heat. Fresh cones were collected and extracted at ordinary room temperatures for this purpose.

e. Natural Reproduction. No further out-over-area studies were carried on but the 1913 data was worked up further as a basis for determining the amount of additional work needed. The series of sixty intensive plots established in 1913 for the study of germination and survival under different conditions of light and heat of white pine and its associate species were observed frequently during the second season and more data obtained.

f. Thinnings. Thinning work was completed in the series of four half-acre plots at the Experiment Station examined and mapped in 1913. No other plots were established but a trip was made to the Bernice area on the Deerlodge Forest preliminary to establish some thinning studies in lodgepole pine. It is planned to establish some of these experiments in February, 1915.

g. Types. The meteorological study of types was continued through a third season and, as a check on the figures obtained for the different types, four additional temporary stations were established at other points on which the same types were found. On tabulating the results of the three years of

observation it appears evident that the relations of the three permanent stations are quite constant from season to season, since they are so close together as to be affected rather uniformly by the same climatic conditions, and that probably no further important differences between the meteorological characteristics of the different types could be established by continuing the work for a longer period. The complete results to date will be worked up into a progress report later in the winter and the determination of whether to continue the work will be based on this report.

8. INVESTIGATIVE POLICY

The most important point in investigative policy is the question as to how much of the time and attention of the Station force and particularly of the technical men should be given to the development and administration of the Station territory. Such administrative work, if carried on properly, is bound to require a very appreciable amount of attention. Looking at it from the narrow view point of what investigative results on the different approved projects can be accomplished within the next few years, by such work, the project seems to involve a large amount of time and expense for a small amount of results to be obtained. Considering it from a broader angle, however, and looking forward to the permanent growth of the Station through an indefinite period of years, the administration of this forest unit will constitute the largest and most-

far-reaching and valuable experiment which it is possible for the Station to carry on.

Compared to this undertaking, the present approved projects are of very small value and consequence except for obtaining rough data for immediate use. The management of this tract is as important to the Station and serves the same function as the management of a tract of farming land in connection with an agricultural experiment station. It will not only furnish opportunities for a great variety of silvicultural experiments but will serve more than anything else could to keep the Experiment Station in close touch with the practical problems arising in connection with the silvicultural administration of the National Forests of this region. It is to help solve these problems that the Station has been established and every policy which will work toward that end should be encouraged.

It is therefore recommended that the active work of developing the Station territory into an intensive management unit be carried on hand in hand with the regular investigative work and that the technical force of the Station give an appreciable, though minor, portion of their time and attention to the reconnaissance work, the preparation of a working plan, reforestation of openings, improvement work, the project of assigning Rangers to the Station during the winter, and other work in connection with the administrative project. It is also suggested that the District and Central Investigative Committees list

this as a definitely approved administrative project, in the silvicultural part of the program.

The policy in regard to forestation projects, which was followed in 1914, was one of concentrating to a certain extent on those which are included in the present program in an attempt to complete the work in a conclusive manner as soon as possible. It is an unquestionable fact that the Station's program is at present heavily overloaded with these forestation projects. Work was started on most of them before it was realized how much time would be required to carry on the volume of work planned and rather than lose the value of the work already done, the best policy seems to be to continue them with a little extra pressure until they can be creditably concluded.

The plan suggested in the 1913 report of cooperating closely with the Office of Planting has worked out very well. Forest Assistant Rogers has kept in very close touch with the Planting organization, especially in the study of old plantations, and has obtained a great deal of help and hearty cooperation from that Office. Forest Examiner White, who is in charge of the Planting Section, recently visited the Station and discussed our investigative results as they affect his work. Among other things, it was decided to furnish extra copies of all working plans and progress reports on forestation projects for his files, in addition to the regular copies furnished the District Office for the "SI" files. The policy of cooperation

with the Office of Planting will be continued in 1915 and will increase in effectiveness as time goes on.

In the management studies such as methods of cutting, effect of thinnings, and natural reproduction, the work has been confined so far to the western white pine type. In the future it will be expanded as rapidly as time and funds permit to the other important timber types of the District, such as the larch-Douglas fir type of northwestern Montana and the lodgepole type of Rocky Mountain region in central Montana, so that work in all of these types can be carried on concurrently. The amount of cutting and number of sales in some of the other types are almost equal to those in the white pine type and the silvicultural problems involved are also in need of further study. The major portion of the management work will still be confined to the white pine type, however.

The establishment of an experimental area on the Deerlodge Forest at Bernice has been suggested by Assistant District Forester Mason. The area in question contains several thousand acres of lodgepole timber of different age-classes. Some of this was thinned for tie cutting a number of years ago and thinnings for fence poles and fire wood have been going on for a long period, in addition to the regular selection and improvement cuttings in Forest Service sales which have been made possible by close utilization of material in the mining industry of Butte and Anaconda, and which have been carried on for several

years. A splendid opportunity of establishing permanent plots for observation of the effect of thinning on growth, windfall, reproduction, etc. are presented within a comparatively small and compact area which is very accessible. Areas are also available for forestation experiments and there is a good nursery site available for raising the necessary stock. The District Ranger, Mr. Williamson, has shown a great deal of interest in marking work and planting and would be an excellent man to look after the work on the ground.

Mr. Mason's proposal is that the Anaconda Copper Mining Company guarantee to take a certain cut from the area annually which will care for a few small operators and a small community of stull cutters and other woods workers. These men would be picked for steadiness and good reputation and would be dependent upon the forest unit for their living.

Under such circumstances the intensive forest management of the area would be very simple to work out and the investigative work could be handled at very small cost to the Service, since the experiments could be installed in connection with timber sales and the actual sale and utilization of the product. The planning and installation of the experiments would be done under the direction of the Experiment Station with the cooperation and help of the local force on the Deerlodge forest, and a trip to the area each year by members of the Station force would be necessary for observation and establishment of new experiments. At any time that it was considered desirable to

establish an experiment Station for the Forests in eastern and central Montana, this area would offer an ideal location as it would, under the present plan, be practically a sub-experiment-station. The gathering together of a number of interesting silvicultural experiments on an area so accessible to Missoula would furnish an opportunity to take District Office visitors out to the area and would stimulate interest in Forest investigative work both in and out of the Service.

The plan is a very excellent one and it is hoped that it can be put into effect within the next year to as large a degree as possible. It is recommended that the District and Central Investigative Committees approve this plan for an experimental management unit at Bernice as a definite administrative project similar to the project for the development of the Priest River area and that it be listed in the next investigative program under silviculture.

In connection with the preparation of progress reports on our work during the winter, it is thought that sufficiently interesting information has now been obtained on a number of projects to warrant the getting up of mimeographed circulars for distribution to the Supervisors, covering the more conclusive results. A brief outline of the purpose and scope of the project will be given at the same time and in this way it is hoped to stimulate the interest of Forest officers throughout the District in the work of the Station. With this interest

created, it is probable that many points noticed by different men in their work which have a bearing on some of our problems will be brought to our attention and the work thus greatly benefitted.

Working plans prepared during the winter of 1913-14 have been of great use in 1914 but we have made alterations in a number of details of procedure as the work progressed. These details will be incorporated in the plans which will thus be kept up to date and plans for new work will be added to them. Although it has been our aim in making plans to try to plan ahead sufficiently to provide for all contingencies and future work on the project, this is obviously not possible in many cases in the present stage of our knowledge of methods of investigation. Changes in details and the addition of plans for new work are therefore necessary and unavoidable in many cases. The best we can hope to do is to add them to the original plan from time to time.

9. COSTS

It is not possible at this time to prepare a detailed analysis of costs for the investigative year 1914 as was done in the 1913 report, since it is desired that this report be available for the District Investigative Committee Meeting on December 12. Such a cost statement will be prepared later on for our own information and that of the District Forester.

Its omission from this report will matter very little since it is a matter which concerns the Station solely in its relation with the District Office.

10. ALLOTMENTS AND ESTIMATES.

As with costs, owing to the necessity of preparing this report for the District Investigative Committee meeting of December 12, there has been small opportunity of preparing a statement of past allotments and an estimate of funds needed for the Fiscal Year 1916. For this reason it is thought best to omit these matters from this general Station report and submit them later in the form of a memorandum for the information of the District Forester and the Forester, some time before the allotments for the season are decided upon.

C O N C L U S I O N

Reports on the individual projects conducted by this Station are being submitted to the District Investigative committee at this time. They will be assembled later in the report of that Committee and will be available in that form.

It is recommended that the foregoing plans for the development of the Station and its work be approved and that action be taken to provide for the various needs of the work as outlined.

Priest River Experiment Station, Dec. 9, 1914.

Respectfully submitted to the District Forester.

Forest Examiner in Charge.



Laboratory Building, Newly Painted in 1914.



Dwelling cottages



Barn, Newly Painted in 1914; Hay Shed on Right.



View up Benton Creek; Part of the Experiment Station Forest.



Meadow Nursery; Conifer Seed Beds and Rows of Hardwoods.



Benton Nursery; Conifer Transplants Showing New Form of Stakes.



Four-Acre Field of Oats; Yellow Pine Type Slope in Background.



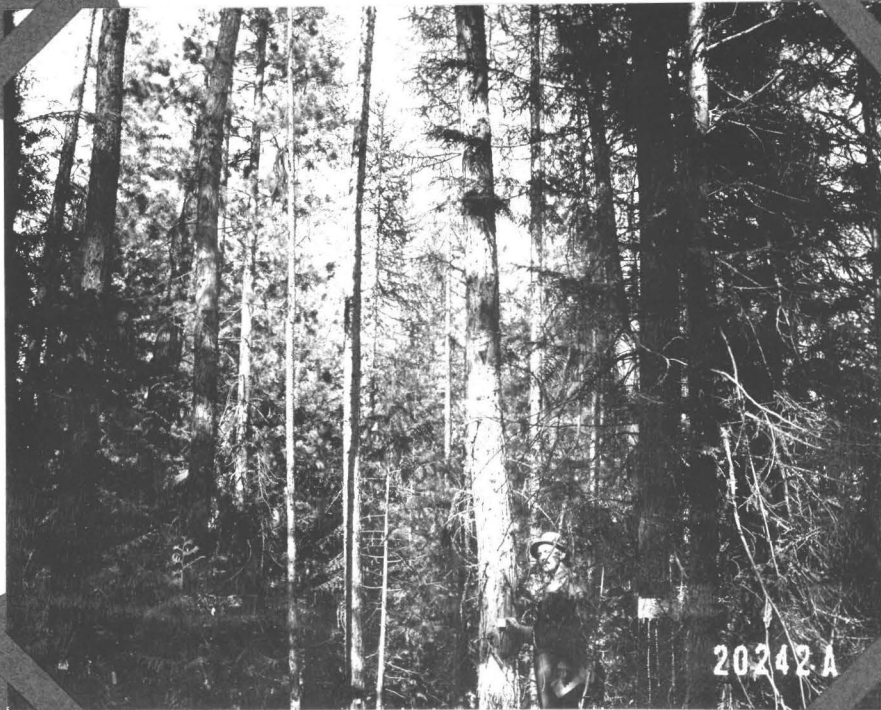
Timber Clearing near Buildings; To be Sown to Grass and Clover.



Typical Unthinned White Pine-Larch Stand; 1100 Trees per Acre.



Severely Thinned Plot; 316 left per acre; Note the Overhead Light.



Moderately Thinned Plot; 455 left per acre; Note Numbered Tag.



Lightly Thinned, 550 left per Acre; Note Rings of White Paint to Designate Trees to be Left.



Lightly Thinned; 550 left per Acre; Note Many Small Trees



Partial Product of Thinning; Unthinned Stand in Back Ground.



Small Logs and Fence Poles Obtained from Thinning;
Windrow of Tops, Branches and Untrimmed Trees Piled for Burning.



Western Yellow Pine Plantation; 1-1 stock from Coconino Forest
In Arizona, three years after Planting, Source of Seed Study.



Pinus strobus Transplant 5 feet High; Three Years After Planting.



Shagbark Hickory Seedling Stock; Three Years after Planting.

FOURTH ANNUAL REPORT
OF THE
PRIEST RIVER EXPERIMENT STATION

SEASON OF 1914

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PART II

PROJECT REPORTS

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C O N T E N T S

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Western White Pine	(Fs-102)	8 - 14
Douglas Fir	(Fs-161)	15 - 18
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Project:

Western Yellow Pine Seed Studies, Fs-101, D-1.

Section (a), Seed Extraction.

Object:

To determine the best methods of extracting western yellow pine seed.

Cooperation:

Office of Planting in the District Office.

Location:

Priest River Experiment Station and St. Joe Forest.

Status:

Germination tests of the experiments conducted by the Office of Planting on the St. Joe Forest in 1913 were made by the Experiment Station during the winter of 1913-14.

Plans for Further Work:

The working plan calls for additional germination tests of the St. Joe experiments for a period of from 3 to 5 years to determine the effect of storage. According to the 1914 recommendations of the Central Committee this phase of the project will be dropped and the data now at hand will be worked up into final report during the present winter.

Use to be made of the Results:

In reforestation.

Date of Completion:

1915.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-1916, - - - - - Nothing.

Fs-101, (a), 1914

Project:

Western Yellow Pine Seed Studies, Fs-101, D-1.

Section (b) Comparative Germination in Greenhouse and Field.

Object:

To compare germination of seed tested in the green-house with that which occurs in the nursery and in actual field operations. To determine to what extent the greenhouse tests are indicative of the possible value when sown.

Cooperation:

Savenac, Boulder, and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac, Boulder and Trapper Creek nurseries.

Status:

Six germination tests of 1000 seed each (duplicate tests of seed from three different sources) were made in a single nursery bed, 4 x 12, under uniform conditions, at each of the four nurseries concerned. Interesting results were obtained which indicate clearly the value of this experiment.

By eliminating the sand test for one kind of seed which is so widely at variance that some outside factor must have affected its accuracy, the following table has been worked out for the Savenac, Priest River and Trapper Creek Nurseries. Results at Boulder have been so consistently below those at the other nurseries for the last three years that it must be considered in a class by itself.

Nursery	Percent of cutting Test 1914	Percent of Pan Test 1914	Percent of Sand Test 1914	Percent of Sand Test 1913
Savenac	65%	84%	108%	109%
Priest River	65%	83%	109%	106%
Trapper Creek	<u>68%</u>	<u>84%</u>	<u>105%</u>	<u>---</u>
Average for all	66%	84%	107%	107%
Boulder Nursery	56%	73%	93%	96%
Minimum variation from average	2%	1%	2%	2%

Maximum variation from averages in above table, shown by individual tests:

Nursery	Percent of cutting Test 1914	Percent of Pan Test 1914	Percent of Sand Test 1914	Percent of Sand Test 1913
Savenac	plus 23%	minus 24%	plus 7%	plus 7%
Priest River	minus 19%	minus 20%	minus 1%	minus 14%
Trapper creek	plus 29%	minus 26%	plus 6%	- - - - -

The work so far indicates, as shown by the above table, that germination results with western yellow pine at the Savenac, Priest River and Trapper Creek nurseries for the first season in spring sown beds can be forecasted within the following limits of accuracy by the use of test figures secured at the Experiment Station:

<u>Kind of Test</u>	<u>Limit of Accuracy</u>
Cutting Test made with knife	20 to 30 percent
Wick and Pan Test, 63 days at an average temperature of 72° F.	20 to 25 percent
Sand Test, greenhouse, 101 days average temperature of 71° F.	1 to 7 percent

The essential accuracy of the 100-day sand test has been established by two successive seasons and it seems evident that it can be used to estimate the stand and density per bed within close limits. That this can be done in actual practice was clearly shown by 20 beds sown at the Savenac in project Fn-101, Section (a) in which stand secured tallied uniformly within a small percent of the predicted stand. (See report on that project)

Much valuable data on germination has been obtained in this project incidental to the main purpose. Germination of native seed was found to be higher than non-native; that is, Bitterroot seed was highest at Trapper Creek, Lolo seed was highest at Savenac and Kaniksu seed was highest at Priest River. This is an additional argument in favor of the use of native seed.

Plans for Further Work:

Tests similar to those of 1914 will be installed at all nurseries in 1915. Other work has indicated that fall sowing of yellow pine may have great merit. The ratio of greenhouse test to germination in fall sown beds should therefore be studied. This has already been started by the installation of

three tests of 1000 seed each at Priest River in November, 1914, to be duplicated in the spring. Working plan will be amended by the addition of plans for this work. The work so far indicates that seed testing must be brought to greater refinement and standardization before the most accurate ratios can be obtained and a special effort will therefore be made during the coming winter to further study and improve seed testing methods. Detailed progress report will be issued in 1915.

Use to be made of Results:

In reforestation.

Date of Completion:

1916, (Changed to include one season's work on fall sowing)

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16. - - - - - \$ _____

Project:

Western Yellow Pine Seed Studies, Fs-101, D-1.

Section (d), Source of Seed.

Object:

To determine the suitability of Seed from different sources to local conditions.

Cooperation:

Location:

Priest River Experiment Station and the Placer Creek and Bernice experimental planting areas.

Status:

Work begun in fall of 1911 and spring of 1912 at Priest River by the installation of 9 field plantations of 1-1 stock from different Forests and Districts on a uniform site. Spring and fall observations 1912 and 1913. Fall places filled, fall, 1913.

Spring and fall counts and observations, 1914. Comparison on basis of survival is not fair because of differences in handling and in amounts of replanting done. A comparison of growth and condition at the end of the third year after planting and the fifth year in age is interesting, however.

Source of seed from which stock was grown	Average Growth 1914	Average Height 1914	General Appearance and Condition of Stock 1914
San Isabel N.F. Col.	2.7"	9.7"	Gray-green, 90% dormant Sturdy and healthy
Sioux N.F., S.Dak.	2.9"	7.1"	Gray-green, 75% dormant a few not healthy; vigorous
Shasta N.F., N.Cal.	3.4"	12.4"	Yellow-green; 95% dormant healthy and vigorous
Colorado N.F. N.Col.	3.4"	12.6"	Gray-green; 95% dormant healthy and vigorous
Coeur d'Alene N.F. Ida.	3.6"	8.0"	Yellow-green; 100% dormant healthy and vigorous
Payette N.F., S. Ida.	3.6"	8.9"	Yellow-green; 100% dormant vigorous; few not healthy
Helena N. F., Mont.	4.1"	9.1"	Yellow-green; 100% dormant healthy and vigorous
Wenaha N.F., E. Oregon	5.1"	15.0"	Yellow-green; 90% dormant healthy and vigorous
Coconino N.F. Ariz.	5.4"	13.1"	Gray-green; 95% dormant rank vigorous growth.

1914 was an exceptionally dry season and it is interesting to note that stock from the San Isabel and Sioux Forests, where the rainfall is less than the other sources, made the smallest amount of growth. No noticeable injury occurred to any lot from drought or frost, however. With increase in the length of time since planting, a gradual re-adjustment seems to be taking place in which stock from northern sources is catching up in annual growth with that from southern sources. The latter, in 1913, showed a noticeably faster and more vigorous growth, probably due to being placed in more favorable moisture conditions than are found in the native environments.

Plans for Further Work:

While it is felt that the inclusion in this project of stock from widely different climatic and geographic regions will be of scientific interest, yet it seems probable that the practical phase of the subject which deals with seed to be collected and used in the nurseries of District 1 will be confined to the northern grown seed from points reasonably close and similar in climate to the nurseries themselves. The principal sources of yellow pine seed in recent years have been the Lolo, and Bitterroot Forests in western Montana and the Idaho, and Boise Forests in Central Idaho. Stock from Idaho and Bitterroot seed has already been planted in other experiments while stock from Boise, Lolo and Kaniksu seed (collected at the Experiment Station) is being grown in the nursery and will be planted in 1915 and 1916. Stock from the Ashley Forest in Utah and the Pecos Forest in New Mexico will also be planted in the spring of 1915 to add to the general scope of the experiment.

It is planned, as soon as the stock is on hand and there is opportunity to install the work, to establish plantations of stock from seed obtained from the principal local sources in Montana and Idaho at the Placer creek Experimental area on the Coeur d'Alene Forest as representing the western Forests and on the Bernice experimental planting area on the Deer-lodge Forest as representing the Forests of central and eastern Montana. A large part or all of these plantations will be installed primarily in connection with some other experiment.

Use to be Made of Results:

In reforestation work.

Date of Completion:

Continuous. Annual progress report.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$50.00

Project:

Western White Pine Seed Studies, Fs-102, D-1.

Section (a), Seed Extraction.

Object:

To determine the best methods of extracting seed of western white pine.

Cooperation:

Section of Planting in the District Office.

Location:

Kaniksu Forest extracting plant and Priest River Experiment Station.

Status:

Experiments on the Minnesota Forest in 1912 not conclusive. Experiment on Kaniksu Forest in 1912 under working plan prepared by Section of Planting. Germination tests of the different lots of seed after different periods of storage carried on at Priest River up to spring 1913.

Testing work dropped in 1914 in accordance with Central Committee's decision. No work on project during past year.

Plans for Further Work:

Final report on the Kaniksu experiments of 1912 to be prepared during winter 1914-15.

Recommended that project be concluded and that no work of the kind be again undertaken until need for it is clearly shown in connection with future seed collecting operations.

Use to be made of Results:

In reforestation.

Date of Completion:

1915.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - Nothing.

Project:

Western White Pine Seed Studies, Fs-102, D-1.

Section (b) Comparative Germination in greenhouse and field.

Object:

To compare germination of seed tested in the greenhouse with that which occurs in the nursery and in actual field operations. To determine to what extent the greenhouse tests are indicative of the possible value when sown.

Cooperation:

With Boulder and Savenac Nurseries.

Location:

Priest River Experiment Station and Boulder and Savenac Nurseries.

Status:

Greenhouse tests during the winters of 1911-12 and 1912-13; nursery tests at Priest River, Savenac, and Boulder nurseries in 1912 and 1913.

Nursery tests at Priest River, Savenac and Boulder nurseries in 1914, - 12 at Priest River and Savenac and 2 at the Boulder. Results obtained were contradictory and inconclusive as shown in the table:

A. *Pinus monticola*, Coeur d'Alene N. F., 1913.

Nursery	Percent of Cutting Test	Percent of Pan Test	Percent of Sand Test
Savenac	0.3%	7.5%	12.0%
Priest River	4.2%	100.0%	160.0%
Boulder	0.5%	12.5%	20.0%

B. *Pinus monticola*, Kaniksu N.F., 1911 (Samples from five different seed canisters tested separately in duplicate)

Nursery	Percent of Cutting Test	Percent of Pan Test	Percent of Sand Test
Savenac	5.5%	117.0%	47.0%
Priest River	16.6%	608.0%	160.0%

In this series the maximum variation from the average ranged

from about 50% for the cutting test to over 300% for the pan test and from 50% to 85% for the sand test.

The principal points brought out by the work so far are that germinating conditions for the species appear more favorable at Priest River than at the other nurseries and that the germinating characteristics of the species are apparently so erratic and little understood and so difficult to control that greenhouse tests as at present made can be of use only as approximate indications of seed value. The fact must be considered, of course, that the heaviest germination of spring sown white pine seed occurs the second season and a much more uniform and satisfactory result may be shown by this series of tests at the end of the 1915 season than appears at present.

Plans for Further Work:

Weekly counts of germination will be continued on the series of tests installed in 1914. To obtain further data on the effect of the season of sowing a new series will be installed with 1914 seed at the Savenac and Priest River nurseries with duplicate tests in the fall of 1915 and spring of 1916. In addition, two tests of 1000 seed each have been sown at Priest River in the fall of 1914 to be duplicated in the spring of 1915. A very complete series of seed tests will be run during the winter of 1914-15 with special detailed records of temperature, moisture, etc. as the basis for a more detailed study of this subject.

Use to be made of Results:

Of practical and immediate importance in all nursery and field sowing.

Probable date of completion:

1916.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Seed Studies, Ps-102, D-1.

Section (d¹) Source of Seed.

Object:

To determine the relative suitability of seed from different sources to local conditions.

Cooperation:

Location:

Priest River Experiment Station and the Placer Creek experimental planting area on the Coeur d'Alene Forest.

Status:

Plots of white pine stock from Idaho, Coeur d'Alene, and Lolo Forest seed have been established in connection with other experiments. Stock from the Kaniksu, Pend O'Reille, Blackfeet, Wenatchee and Colville Forests is being grown in the nursery and will be available for planting in 1915 and 1916.

No specific work in 1914 except care of the stock in the nursery. Planted plots not established long enough to make a comparison of growth and condition valuable at present.

Plans for Further Work:

Installations will be completed at Priest River as fast as the planting stock becomes available. Plantations will be installed with stock from different seed sources on the Placer Creek area in connection with other experiments. As soon as these become well established, it will be possible to make observations showing the effect of the source of seed.

Use to be made of Results:

In reforestation work:

Probable Date of Completion:

Continuous.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Seed Studies, Fs-102, D-1.

Section (d-2) Source of Seed.

Object:

To determine the relative quantity and fertility of seed produced by different kinds of trees.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Some information obtained in connection with the study of western white pine seed production.

Only work done on this project in 1914 was the collection from squirrel caches of seed from three different aged stands, - 50-year, 140-year, and 250-year. This seed will be extracted and germinated during the coming winter.

Plans for Further Work:

No timber cutting was in progress on the Kaniksu Forest at the time of seed ripening in 1914, but it is hoped that there will be an opportunity in 1915 to collect seed on some sale operation either on that or some neighboring Forest. This seed will be collected from individual trees and close records will be obtained in regard to viability and other points involved. A working plan for this work will be prepared during the coming year and before the commencement of operations.

Use to be made of Results:

In marking timber for Cutting.

Probable Date of Completion:

Continuous.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Seed Studies, Fs-102, D-1.

Section (e), Physiological characteristics and Methods of stimulating Germination.

Object:

To investigate the reason for the peculiar sluggishness of western white pine germination, with a view to overcoming it with some method of stimulation.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Considerable work was done with chemical stimulation in winter of 1912-13 and with heat and moisture stimulation in summer 1913.

Several pounds of white pine seed were sent to the D. Hill Nursery Co. of Dundee, Ill. to be treated by a secret process by their expert in such work. He offered to do the treating but refused to divulge the method. The seed was received at the Experiment Station in April, 1914 packed in moist sawdust and was immediately sown in two beds, one broadcast and the other in drills. Frequent counts of germination and survival were made during the summer. The treatment gave no apparent stimulating effect as shown by the following table:

<u>Bed.</u>	<u>Germination Percent.</u>
Broadcast, treated by D. Hill	- - - - -11.0%
Drills, " " " " " "	- - - - -6.4%
Untreated bed, same seed, as check	- - - - -11.9%

Germination counts during the second season will probably not change this relation noticeably. Moreover, from the mere fact that the treatment failed to secure a full stand during the first season, it must be considered a failure and the fact that no additional germination whatever over the check was secured makes it even more conclusively so.

In August, 1913, 3 lots of white pine seed were treated by first soaking in cold water 24 hours and then placing in moist flannel in an incubator at 90 degrees F. for 8 days, 12 days, and 17 days respectively, after which seed was sown in the regular way in the nursery. The table shows results obtained.

Plot:	Das.in:	Date	:	No.:	Fall-1913:	Season-1914:	1913	and	1914	
No. :	Incu-:	Sown:	:	Seed:	-----:	-----:				
:bator.:		:Sown:		Germ:	Surv:	Germ.:	Surv.:	Germ. :	Surv.	
1	8 days	8/29/13		3000	7.6%	0.0%	11.4%	80.0%	18.0%	44.0%
2	12 "	9/2 /13		4500	0.8%	0.0%	17.0%	85.5%	17.8%	81.0%
3	17 "	9/7 /13		3000	0.1%	0.0%	12.9%	83.0%	12.9%	82.8%

The seed used in this experiment was of the Kaniksu, 1911, collection but had been stored differently from that treated by D. Hill so that an exact comparison is not possible. It seems evident that the incubator treatment had a distinctly stimulating effect. Although part of this might have been due to the fact that seed was sown in the fall and lay in the ground over winter, previous studies do not show that as large an increase as this is obtained from fall sowing alone.

Plans for Further Work:

The favorable indications obtained as to the incubator treatment will be followed up by further experiments in 1915. Some experiments in stratification will be carried on during the winter of 1914-15 and germination tests made in the nursery in 1915. Structural and physiological studies in the laboratory and greenhouse will be made from time to time followed by nursery tests. It is a complicated problem which will require considerable study before a solution can be found.

Use to be Made of Results:

Of practical importance in nursery operations, also in management studies of natural reproduction.

Probable date of Completion:

Several years.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Douglas Fir Seed Studies, Fs-161, D-1.

Section (b), Comparative Germination in Greenhouse and Field.

Object:

To compare germination of seed tested in the greenhouse with that which occurs in the nursery and actual field operations. To determine to what extent greenhouse tests are indicative of the possible value when sown.

Cooperation:

Savenac and Boulder Nurseries.

Location:

Priest River Experiment Station and Savenac and Boulder nurseries.

Status:

Greenhouse tests winters of 1911-12, 1912-13 with nursery tests at Priest River, Savenac and Boulder, 1912 and 1913.

Greenhouse tests winter 1913-14 and duplicate nursery tests at Priest River, Savenac and Boulder, summer 1914. The following table shows the results obtained:

(Lolo, 1913 seed used in 1914 tests)	Percent of Cutting Test	Percent of Pan Test.	Percent of Sand Test.	
	1914	1914	1914**	1913°
Savenac Nursery	52%	84%	148%	116%
Priest River Exp. Sta.	44%	72%	127%	135%
Boulder Nursery	43%	70%	123%	94%
Average all nurseries	46%	75%	133%	115%
Maximum plus variation	6%	9%	15%	20%
Maximum minus variation	3%	5%	10%	21%

° Test of Wenatchee, 1911, seed, 70 days. **Tested for 70 days

Considering that the samples were from different sources, there is a very fair correspondence between the 1913 and 1914 sand tests. Closer results might have been obtained if the tests had been continued up to 100 days! It is thought that, for lack of better information, the average percentages in the above table can be used to very good advantage in obtaining

desired densities within 10 per cent, particularly if 5% above the average is used at Savenac and 5% below the average is used at Boulder and the exact average is used at Priest River.

Plans for Further Work:

Tests similar to those of 1914 will be made in 1915 except that a series sown in the fall of 1914 will be added to those to be sown in the spring of 1915 at Priest River. Additional tests will be put in at all nurseries in the fall of 1915 and spring of 1916 and it is hoped that fairly conclusive results will be obtained at the end of the 1916 season. Working plan will be brought up to date during the winter of 1914-15.

Use to be made of Results:

In reforestation.

Probable Date of Completion:

1916 (Changed from 1915 in order to include an additional series of fall and spring tests)

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16. - - - - -

Project:

Douglas Fir Seed Studies, Fs-161, D-1.

Section (d), Source of Seed.

Object:

To determine the suitability of seed from different sources to local conditions.

Cooperation:

Location:

Priest River Experiment Station and the Placer Creek and Bernice experimental planting areas.

Status:

Work begun in the fall of 1911 at Priest River by the installation of 5 field plantations of 2-1 stock from different Forests and Districts on a uniform site. Spring and fall observations in 1912 and 1913; fall places filled and one more plantation installed, fall of 1913.

In 1914, spring and fall observations were made on the six plantations. Condition in the fall is shown below:

Source of Seed from which Stock was Grown	Average Growth 1914	Average Height 1914	General Appearance and Condition of Stock 1914
Pocatello N. F., S. Idaho	0.3"	6.1"	Dormant; all tender tips killed in spring by fungus; sickly yellow green; unthrifty
San Isabel F. S. Colorado	0.4"	5.2"	Dormant; 50% tender tips killed in spring by fungus; healthy blue green; small but thrifty
Boise N. F., Central Idaho	0.5"	6.4"	Dormant; 90% tender tips killed in spring by fungus; 50% sickly yellow green, balance healthy.
Pike N. F. Central Colorado	0.5"	7.8"	Mostly dormant; grayish green; some sickly yellow; all tender tips killed in spring by fungus.
Columbia F. South Washington	0.6"	8.8"	Dormant; all tips killed by fungus; many winter-killed; sickly yellow green and unthrifty.
Helena N. F., Central Montana	1.1"	5.6"	Dormant; 30% tips killed by fungus; healthy blue-green; thrifty and vigorous but slow growth.

* Pocatello stock planted fall 1913; not yet well established.

The killing of the tender tips in the spring and early summer by a fungus seems characteristic of all Douglas Fir growing on the sandy flat where these plantations are located. The trouble affects native wild seedlings growing nearby to a greater or less extent as well as plants which have been introduced from other localities. It has not been known to be fatal but by killing back all of the principal leaders it forces the plant to make its growth from the lower side branches, thus producing a short bushy form rather than the normal and desirable conical form. It has affected much of the transplant stock in the same way. Specimens were shown to the District Pathologist but he could neither identify it off hand nor suggest a remedy.

The Helena Stock, which is more nearly native to the locality than any of the others appears to be making the best showing. It will not be possible to make definite comparisons, however, between the different lots until several more years have elapsed.

Plans for Further Work:

The present plantations do not fully cover the field of possible sources of seed for use in District 1 and stock is being raised in the nursery from several other localities which will be planted in adjacent plots when old enough. These later installations will include stock from the following different sources: Kaniksu Forest (Priest River Exp. Station) Madison Forest (S.W. Mont.) Lolo Forest (W. Mont.) Kootenai Forest (N.W. Mont.) Colville Forest (N.E. Wash.), Wenatchee Forest (E. slope Cascades, Wash.) Tacoma, Wash. (Pacific Coast type), and Pecos Forest (New Mexico).

In connection with other projects, plantations will be installed from time to time at the Placer Creek planting area on the Coeur d'Alene Forest and the Bernice experimental area on the Deerlodge Forest of Douglas fir stock from different sources. In connection with taking records, the effect of source of seed can be noted and the information incorporated with this project.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Continuous, periodic progress reports.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Larch Seed Studies, Fs-141, D-1.

Section (a), Seed Extraction.

Object:

To determine the best methods to use in extracting seed of Western Larch.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Very little work has been done. No work in 1914.

Plans for Further Work:

Future work only in connection with regular seed collecting operations. An attempt will be made to collect a small quantity of fresh larch seed in the fall of 1915 and if possible some experiments in the best methods to use in extracting will be carried out at the Experiment Station in connection with extracting operation.

Use to be Made of Results:

In future reforestation.

Probable Date of Completion:

Indefinite; depends upon seed crops and the possibility of doing collecting work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - _____

Project:

Western Larch Seed Studies, Fs-141, B-1.

Section (d), Source of Seed.

Object:

To determine the suitability of seed from different sources to local conditions.

Cooperation:

Location:

Priest River Experiment Station and the Placer Creek experimental planting area.

Status:

Proposed new section; no work yet done.

Plans for Further Work:

Seed will be obtained from as many different sources as possible and stock raised and planted at Priest River and Placer Creek. Working Plan will first be made.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Continuous.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Seed Studies, Fs-141, D-1.

Section (b), Comparative Germination in Greenhouse and Field.

Object:

To compare germination of seed tested in the greenhouse with that which occurs in the nursery and in actual field operations. To determine to what extent the greenhouse tests are indicative of possible value when sown.

Cooperation:

Savenac, Boulder and Trapper Creek nurseries:

Location:

Priest River Experiment Station and Savenac, Boulder and Trapper Creek Nurseries.

Status:

Experiments at Priest River, Savenac and Boulder in 1912, 1913 and 1914. Results so far are contradictory owing to lack of knowledge of the best way to test larch seed and lack of fresh seed. Section omitted from the 1914 Program by mistake.

Plans for Further Work:

Data now on hand will be assembled for a progress report during the present winter.

As soon as fresh larch seed can be obtained, probably in the fall of 1915 a new series of experiments will be installed. One bed was sown to larch at Priest River in the fall of 1914 and will be duplicated spring of 1915.

Use to be Made of Results.

In reforestation.

Probable Date of Completion.

1918 if seed can be obtained.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Engelmann Spruce Seed Studies, Ps-146, D-1.

Section (b) Comparative Germination in Greenhouse and field and section (d), Source of Seed.

Object:

Same as given under Sections (b) and (d) under other projects.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery and Placer Creek Planting Area.

Status:

Proposed new sections; nothing yet done.

Plans for Future Work:

Working plans to be prepared and work started if the proposed expansion of the forestation work is approved.

Use to be Made of Results:

In reforestation.

Probable Date of Completion.

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Red Cedar Seed Studies, Fs-182, D-1.

Section (a), Seed Extraction.

Object:

To determine the best methods to use in extracting seed of western red cedar.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Very little work has been done. No work done in 1914.

Plans for Further Work:

Future work will be conducted only in connection with regular seed collecting operations. Since there is no particular demand for this seed at present, it is impossible to say definitely when this will be, but if there is a good crop in the fall of 1915 and opportunity permits, an effort will be made to collect a small amount and carry on some simple experiments in extraction at that time.

Use to be Made of results:

In future reforestation.

Probable date of Completion:

Indefinite; possibly 1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Red Cedar Seed Studies, Fs-182, D-1.

Section (b), Comparative Germination in Greenhouse and field.

Object:

To compare germination of seed tested in the greenhouse with that which occurs in the nursery and in actual field operations. To determine to what extent the greenhouse tests are indicative of the possible value when sown.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Proposed new section; nothing yet done.

Plans for Further Work:

As soon as seed is obtained field and greenhouse tests will be made annually until conclusive data is obtained. A working plan will be prepared in advance of the work.

Use to be made of Results:

In reforestation.

Probable Date of Completion.

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1

Section (a), Amount of Seed to Sow.

Object:

To determine the amount of seed to be sown in seed beds.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

Experiments were conducted at the Savenac nursery in 1913 which were not conclusive but which gave valuable indications. A report of these experiments is given in the working plan.

In accordance with working plan prepared February, 1914, 8 beds, 4x12, were sown at the Savenac May 16. After close study of the greenhouse test, it was estimated that the seed used (Lolo, 1912), would yield about 4000 seedlings per pound. The amount required to secure the different densities wanted was then carefully weighed to tenths of a gram and the essential accuracy of the results secured is shown in the table:

Unit No.	Amount of Seed Sown	Advance Estimate of density.	Actual density secured Oct. 1914	Percent of Est. Actually secured	Approximate loss per bed	
					Amt.	Percent
409	12½ Oz	3125	3686	118.0%	216	5.9%
410	1 lb.-	1½ " 4375	4749	108.5%	384	8.1%
411	1 "	6½ " 5625	5753	102.3%	288	5.0%
412	1 "	11½ " 6875	6976	101.5%	288	4.1%
413	2 "	½ " 8125	8480	104.4%	600	7.1%
414	2 "	8 " 10000	10020	100.2%	408	4.0%
415	2 "	13 " 11250	11235	99.9%	600	5.3%
416	3 "	2 " 12500	13212	105.7%	1104	8.3%
Averages		7734	8014	105.1%	461	6.0%

The experiment clearly demonstrates that it is possible to regulate the density of the stand per bed within 5 percent, provided that seed is accurately weighed out, when a good seed test has been made and the percent of the greenhouse test which can be expected in the nursery is known (See Fs-101 Sec. (b)). Since control of density is one of the most important factors in the growing of good seedling stock cheaply, the value and need of accurate methods of seed testing and a thorough investigation of comparative germination in greenhouse and nursery is very apparent.

Stands secured in the regular nursery beds when sown with the same number of pounds per bed have shown wide variations in the number of seedlings in individual beds. Such beds are not protected from mice by screens but soil and growing conditions and method of sowing are quite uniform. The seed is weighed to ounces with a postal scale and it is possible that in doing fast work in the installation of a large number of beds, the amounts weighed out for individual beds have varied one or two ounces either way from the exact amount specified. This might account for a discrepancy of from 500 to 1000 seedlings or more between different beds. Slight differences in the local conditions and the amounts (if any) eaten by mice would account for the balance. It is thought that it would be entirely practicable and require little or no more time than the present method to weigh out the seed used in the regular beds to tenths of grams on the trip balance which was purchased last spring for the Savenac and which has a capacity of 4 pounds. In this way, one of the principal troubles in securing uniform density would be avoided. The ratio, - 28.3 grams equals 1 ounce, - will give correct results.

At Trapper Creek Nursery, 10 beds were sown in drills 6 inches apart, 2 beds with each of five different amounts. At the time the plans were made none of the seed which it was desired to use had been tested so that only a very rough guess was possible in estimating the stand to be secured per bed. The amounts to be sown were based on a 40% estimate. The actual germination was only 24.3% and survival 22.7%. It is interesting to note that the sand test of this seed, made later, was 10.0% and that in the Fs-101 (b) tests, seed from this source sown in drills at Trapper Creek gave a germination of 243% of the sand test which is exactly what was secured in the average of these ten beds. This is additional evidence that accurate results may be obtained by the use of seed tests and comparative germination percentage figures. The seed used was weighed to 1/10th gram and the duplicate beds for each amount tallied very closely -- variation being from 0.5% to 5.2% and averaging 3.5%.

Just as at the Savenac, the stand secured per bed varied quite closely with the amount of seed sown and showed clearly that density of the stand could be controlled accurately by varying the quantity of seed. The following table gives the figures obtained:

Unit	Amount of	40% estimate:	24% estimate:	Actual Stand	
Num-ber	Seed Sown	Rough Guess	on Basis of Sand Test	Average Number	Percent of 24% Estim.
421	5 ounces	1000	660	599	90.8%
422	7½ "	1500	990	973	98.3%
423	10 "	2000	1320	1338	101.4%
424	15 "	3000	1980	1843	93.1%
425	20 "	4000	2640	2625	99.4%
Average percent of 24% estimate secured in beds - - -					96.6%

From these figures, it is apparent that density can be controlled within 5 percent average and 10 percent maximum variation.

Plans for Further Work:

Work at Savenac and Trapper Creek will be pursued in accordance with the working plan which provides for thorough field tests of different age classes of stock raised at different densities.

Use to be Made of Results:

In Nursery work.

Probable Date of Completion:

1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - -

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (b), Time of Sowing.

Object:

To determine the best time of sowing seed in seed beds.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

Incomplete experiments in 1912 and 1913 at Savenac and Priest River favored May 1 as the best date for sowing yellow pine.

Two experiments were carried on at Savenac in 1914, - the first consisting of 2 plots of 500 seeds, one sown September 15, 1913 and the other May 1, 1914, not protected from mice; the second consisting of 5 protected plots, 1 sown May 1, 2 sown May 15 and 2 sown June 1, 1914, each containing 2000 seeds.

The spring series of 5 plots brought out the following points quite clearly:

1. May 1 sowing produced the greatest total germination.
2. A smaller percent of loss from damping off and sunscorch occurred in the May 1 sowing.
3. May 1 sowing produced the fastest and earliest germination; consequently the stock from this sowing was the largest, best developed and most uniform of all the spring sown stock at the end of the season.

The fall and spring series indicated the following points:

1. Germination in the fall plot started 3 weeks ahead of the spring plot and was practically complete before germination in the spring plot started. This is shown in the table below:

Date of: Percent of Total Germination germinating between
Sowing : 4/20-5/18:5/18-6/16:6/16-7/18:7/18-8/20:8/20-9/29

Sept. 15	98.5%	0.5%	0.5%	0.5%	0.0%
May 1	0.0%	44.0%	42.0%	12.0%	2.0%

2. The fall sown plot, on account of its rapid and early germination, produced noticeably larger, stronger and better developed and matured plants than the spring sown plot and the stock was of course much more uniform.

3. The germination in the fall plot was 37% while that in the spring plot was only 30%, although the value of this comparison is discounted by the fact that neither plot was protected from mice. Men at the nursery consider danger from mice very small, however, on account of the presence of numerous cats.

At Priest River, an excellent comparison between germination and growth in fall sown and spring sown beds was obtained.

 Date of : Method : Percent of total germination during : Total loss
 Sowing : Used : Apr-May : June : July : August : Sept-Oct : in % of Germ.

11/13/13	Bcast	91.4%	8.6%	0.0%	0.0%	0.0%	28.8%
11/13/13	Drills	98.2%	1.8%	0.0%	0.0%	0.0%	43.0%
5/4/14	Bcast	13.9%	35.1%	49.0%	1.3%	0.7%	14.7%

As at the Savenac, germination in the fall sown beds started soon after the middle of April and was practically over by the end of May when the spring bed was just beginning.

 Date of : Meth : Average Growth and Development of Seedlings
 Sowing : od : Length of : Length of : Length of : Diameter of
 : Used : Root-Inches : Stem-Inches : Leaf-Inches : Stem- Mm

11/13/13	Bcast	11.9"	2.5"	0.87"	1.7 mm
11/13/13	Drill	11.5"	2.9"	0.96"	1.6 mm
5/4/14	Bcast	9.7"	2.0"	0.94"	1.5 mm

It is quite evident that the fall seedlings are ahead of those sown in the spring in size and development.

As a test of the vitality of fall and spring seedlings, a quantity of each were transplanted in October and carefully mulched and will be followed through the next growing season.

An experiment was installed at Trapper Creek nursery consisting two plots 1' x 4', sown with 500 seeds and two plots 4' x 6' sown with 8 ounces of seed; one of each kind of plot being sown May 21 and the other June 9. In the small plots seedlings were pulled at time of counting and a record of survival only was kept in the large plots. Progress of germination is shown in the following table:

 Date of: Germination in percent of Total occurring between: Total
 Sowing : 6/1-6/18: 6/18-7/1: 7/1-7/29: 7/29-8/26: 8/26-10/1: Germ%

5/21	74.1%	13.0%	11.1%	1.8%	0.0%	10.8%
6/9	0.0%	43.6%	31.9%	25.5%	0.0%	18.8%

Any differences in development will show up when the measurements are taken at time of transplanting in the spring of 1915.

Plans for Further Work:

Measurements of the stock raised in the Savenac experiments will be taken at time of transplanting in the spring of 1915. The transplants will then be followed through at least one season as a test of vitality.

A part of the stock in the Priest River beds will be taken up and transplanted in the spring of 1915 and the balance will be left and planted in the spring of 1916 in the field to determine the effect of time of sowing upon 2-year-old planting stock. The transplants put in in 1914 and 1915 will be following for two years in the transplant beds and if necessary will be used in a field planting test at the end of that time to determine the effect of time of sowing upon transplants.

Half of the stock in the 4x6 plots at Trapper Creek will be measured when transplanted in the spring of 1915 and followed through one year in the transplant beds. The other half will be left until 2 years old and field planted to determine effect of time of sowing. The experiment as carried on in 1914 was hardly complete and did not follow the working plan. An additional series following the plan should be conducted in 1915. In the fall of 1915 and spring of 1916 a further series should be put in to determine the difference between fall and early spring sowing.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

1916; changed from 1915 to provide for further work planned in growth tests and additional experiments.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (c), Preliminary Treatment of Seed.

Object:

To determine methods of securing a better class of seedlings either by preliminary treatment of the seed or by grading by size or weight.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

Proposed new section: Nothing yet done.

Plans for Further Work:

Working plan to be prepared and work started in 1915.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1,
Section (d), Depth of Covering Seed.

Object:

To determine the depth to which seed should be covered
in the seed beds in order to produce the best results.

Cooperation:

Savenac and Trapper Creek Nursery.

Location:

Priest River Experiment Station and Savenac and Trapper
Creek Nurseries.

Status:

Experiments in 1912 and 1913 considered conclusively
in favor of shallow sowing at an average depth of $3/8$ inch
with allowable variation from $1/4$ inch to $1/2$ inch, for broad-
cast sowing at Priest River and Savenac.

In 1914, at Trapper Creek, four plots $1' \times 4'$ were sown
with 600 seeds each at depths of $1/4''$; $3/8''$; $1/2''$; and $5/8''$,
in drills, May 27. Following table shows the germination:

<u>Depth of:Progress of Germination in Percents:Total Germination</u>									
<u>Covering:6/14 : 7/1 : 7/15 : 7/22 :7/22-10/1:Numb:Perc't;Loss:</u>									
$1/4''$	12.3%	70.5%	15.3%	0.0%	1.9%	163	27.2%	3.0%	
$3/8''$	2.2%	72.5%	24.8%	0.0%	0.5%	177	29.5%	13.0%	
$1/2''$	3.0%	86.2%	7.2%	1.8%	1.8%	166	27.7%	5.5%	
$5/8''$	0.0%	81.7%	15.6%	0.7%	2.0%	148	24.7%	8.5%	

It is seen from the table that in general the fastest and high-
est germination occurred at the lesser depths and the slowest
and lowest germination at the greater depths. This is in
close accord with the results at Savenac and Priest River.
The differences shown are all small, however, and in a few ca-
ses slightly inconsistent. At the same time it appears quite
conclusive that the specification made for Savenac and Priest
River of $3/8''$ average with allowable variation from $1/4''$ to
 $1/2''$ will be as satisfactory as any at Trapper Creek when cov-
ering material and watering are similar to what was used in
these tests.

Plans for Further Work:

It is thought that this problem has been solved conclusively enough to serve all practical needs in the nurseries of the District, at least for the present. No further work is planned, therefore, and a complete progress report of the work done on this section will be prepared during the coming winter and distributed to the nurseries. Since this is merely a section of the project, opportunities for studying depth of covering in connection with some other section may come up from time to time and will tend to build up further evidence either supporting or disproving the present conclusions.

Use to be Made of Results:

Nursery Work.

Probable Date of Completion:

1915; changed from 1916 because work is concluded.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - Nothing.

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

S Section (e), Methods of Sowing.

Object:

To determine the best methods of sowing in the nursery bed.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

Experiments at Priest River in 1912 not conclusive; experiments in 1913 showed (1) that germination in the broadcast plots was about 1/5th greater than in drills and (2) that survival of seedlings in broadcast plots was greater than in drills, seedlings in the former being less sensitive to attacks of damping off, than in the latter.

In the spring of 1914 measurements and weights were taken at time of transplanting, of the stock in the 1913 experiment. The broadcast seedlings showed 6% greater length than those in drills, all of which was in the root; The drill seedlings showed, on the other hand, 14% greater weight, all of which was in the tops. It is thought that these slight differences are due largely, if not entirely, to the fact that the stand in the drills averaged 96 per square foot while that in the broadcast plots averaged 128 per square foot or 1/3 more. The additional growing space afforded the stock in the drills would account for a slightly shorter root and a taller heavier top than the other stock showed. The lesser germination and greater mortality in the drills of course directly contributed to the lesser density in the drills.

In the fall of 1913 one bed was sown in drills and one broadcast. In spite of protective screens, mice got in during the winter and ate some of the seed so that a comparison of amount of germination is of little value. In the drills the total during the season was 1/4 more than in the broadcast bed. This was largely offset, however, by the almost 50% greater loss from damping off in the drilled bed. As in the previous experiment, the broadcasted seedlings showed a slightly longer root and shorter top than did these in the drills. Total length of plants was identical, as was also total weight, so that in de-

velopment there was no essential difference between the two.

The only material differences that have been shown between these two methods of sowing have been in the matter of economy of time, space and of seed. Broadcast sowing leads in these points, for it is cheaper and faster, it gives slightly but consistently greater germination accompanied by less loss from damping off, and produces a larger number of well developed seedlings per unit of area.

The only advantages apparently to be obtained from sowing in drills are that opportunity is afforded for cultivating and for pruning the roots in place.

Plans for Further Work:

It is thought that the results to date are sufficiently conclusive for practical application in the nurseries of the District since they check with what has been learned from general observation. No further field work is planned therefore on this section. The data obtained will be gathered into a complete progress report to be issued during the coming year.

Use to be Made of Results:

Nursery work.

Probable Date of Completion:

1915.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - Nothing.

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (f), Fertilizing.

Object:

To determine the value of various mulches and manure fertilizers in seed and transplant beds, as well the time for application.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments on seed beds and transplant beds in 1913 at Savenac Nursery demonstrated that a notable increase in size and development followed the application of nitrogenous animal fertilizers such as dried blood and animal meal.

Experiments, using 20 beds, in which 2 beds were treated with each of nine different fertilizers, and 2 beds were left unfertilized as a check, were conducted at Savenac in 1914. Important differences are shown in the table below:

Unit: Numb:	Fertilizers Used	:Av.Lgth: :of Top	:Av.Wt.: :of Top	:Av.Diam: :of Stem	Characteristic Color
401	3# Dried Blood	1.97in.	0.58gm	1.60mm	Deep blue-green healthy looking
406	2 1/2# Dried Blood	1.92 "	0.54 "	1.55 "	Deep blue-green healthy looking
405	1/2# Sulph Potash				
405	5# Animal Meal	1.82 "	0.58 "	1.58 "	Deep blue-green healthy looking
404	4# Animal Meal	1.94 "	0.57 "	1.63 "	Deep blue-green healthy looking
409	1/2# Sulph Potash				
409	20# Pulverized Sheep manure	1.73 "	0.54 "	1.58 "	Dark-green, healthy looking.
402	3# Superphosphate	1.54 "	0.36 "	1.34 "	Yellow-green, Unhealthy-looking
403	1# Sulph Potash	1.48 "	0.37 "	1.38 "	Yellow-green, Unthrifty looking
408	12# Sheep Manure pulverized	1.30 "	0.37 "	1.33 "	Dark yellow-green; fairly thrifty.
407	2# Super phosph.	1.29 "	0.37 "	1.34 "	Light-yellow-green Unthrifty looking
410	1# Sulph Potash				
410	Not Fertilized	1.52 "	0.39 "	1.44 "	Medium-yellow-green Fairly thrifty

The differences shown in development, color and general thriftiness were quite marked. The first five units are noticeably larger than the rest and are uniformly dark green and healthy-looking. With the exception of unit 408, these are the only ones which contained nitrogenous fertilizers and the differences between these vary directly with the amount of nitrogen contained in the fertilizers:

Unit Number	Fertilizer Used	Amount of Nitrogen in Pounds per Bed	Cost per Bed
401	3# Dried Blood	0.30#	\$ 0.09
406	2½# Dried Blood	0.25#	0.09½
	½# Sulph. Potash		
405	5# Animal Meal	0.25#	0.07½
404	4# Animal Meal	0.20#	0.08
	½# Sulph Potash		
409	20# Sheep Manure	0.25#	0.25
408	12# Sheep Manure	0.15#	0.15

Sulphate of Potash and superphosphate produced no beneficial effect either alone or in mixture. The benefits seem to have been wholly due to the nitrogen added to the soil. In the case of the sheep manure (although an especially high grade of pulverized manure was used) the nitrogen seems to have been less available than in the other forms. The application of the large quantities of sheep manure is also more expensive and the high cost of material per bed is prohibitive.

Application of 0.30 pounds nitrogen per bed in the form of either dried blood or animal meal will each cost 9 cents. The blood would require 2/5 less freight cost but this would be offset by the fact that 0.66 pounds of phosphate in the form of ground bone would be added to the bed with the animal meal. Another year may demonstrate that this phosphate has distinct value since it is probably more or less non-available the first season unless applied in the fall.

Plans for Further Work:

The working plan provides for transplanting and field planting tests of the stock raised in the 1914 beds. The effect of adding animal meal and dried blood both in the fall and spring will be tested in a series of beds installed in the fall of 1915 and spring of 1916.

Use to be Made of Results:

Nursery Work.

Probable Date of Completion:

1918, Changed from 1915 to provide for two years counts on field planting tests.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, A-1.

Section (g), Shading.

Object:

To determine the effect of different degrees of shade on germination, and development of seedlings and hardiness of trees when placed in the field.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments at Priest River in 1913 indicated that no shade was best for western yellow pine.

Further experiments at Priest River in 1914 were very conclusive in confirming the 1913 results, as shown in table:

Amount of Shade	Length of Stem	Length of Leaf	Diam. of Stem	General Appearance
None	2.4 In.	1.07 In.	1.8 mm.	Healthy, vigorous
1/4	1.8 "	0.87 "	1.3 "	Moderately good
1/2	1.5 "	0.86 "	1.3 "	Poor; unthrifty.

In addition to producing poorer stock, shading retarded and decreased germination and increased damping off.

Plans for Further Work:

Stock in the 1913 and 1914 tests will be followed through transplanting and field planting to determine whether the detrimental effect of shading the seedlings persists in later years.

Results to date are considered conclusive enough for practical application in the nurseries and no further experiments will be undertaken.

Use to be Made of Results:

In Nursery Work.

Probable date of Completion:

1916.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year, 1915-16, - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (h), Watering.

Object:

To determine the amount and intervals of watering seedbeds as well as the effect of substituting cultivation for watering of seed and transplant beds.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments started at Priest River in 1913 to compare heavy watering without cultivation, light watering with cultivation and cultivation without watering. No definite results first season.

1913 experiments were continued throughout 1914, one bed being given the equivalent of 1.5 inches of water per week in two applications, without cultivation; one bed being given 0.75 inches per week in one application together with cultivation after watering and rains; and the third bed being given no water but cultivation after rains. The amount of water received by the first two included rainfall. The development of the stock is shown in the following table:

Treatment	Given: Length of: Length of: Length of: Diameter: Average
To Bed	: Root : Stem : Leaf : of Stem : Weight
Heavy Watering	13.6" 2.8" 2.1" 2.1 mm. 0.679 gm
Light Watering	14.4" 3.0" 2.3" 2.3 mm. 0.740 gm
Cultivation	11.7" 2.3" 1.9" 1.8 mm. 0.393 gm

The stock which received light watering and cultivation is noticeably and consistently the largest and best developed. The heavily watered seedlings are not far behind, however and it is probable that watering was the principal factor in producing the superior stock. It further seems apparent that the amount of water given the "light watered" bed,--0.75 inches per week or 3.0 inches per month,-- is sufficient for all the needs

of the plant. Cultivation was probably responsible for the slight difference between the heavily and lightly watered seedlings.

Plans for Further Work:

A transplanting test will be made of the stock raised in the 1913-14 experiment and the stock will be followed into field planting if thought advisable in order to establish the effect of the differences in watering and cultivation. No. new experiments are planned for the present under this section.

Use to be Made of Results:

In Nursery work.

Probable Date of Completion.

1916; possibly 1917 if field plantations are included.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (1), Root Development.

Object:

To develop by means of methods of preparation and treatment of seed beds, root pruning, and transplanting, a root system favorable to successful planting.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

In 1912 and 1913, yellow pine was pruned in place in drilled beds with a spade and by cutting at time of transplanting at all three nurseries.

Planting tests of pruned and unpruned stock at Priest River installed May, 1914. Results of first season follow:

Age :	Treatment of Roots	Survival-1914:	Average:	Average
class:	before planting.	Number:Percent:	Growth:	Height

2-0	<u>Not</u> Root pruned in place	287	72%	1.8"	5.0"
2-0	Root Pruned with Spade	337	86%	1.3"	4.0"
1-1	<u>Not</u> Pruned at Transplantg	321	80%	1.1"	3.7"
1-1	Pruned at Transplanting to 4 $\frac{1}{8}$ " below 1st lateral	343	86%	1.3"	4.1"

In survival the root pruned stock is noticeably in the lead. In growth the unpruned seedlings lead while the pruned transplants are ahead.

An interesting comparison between seedlings and transplants is also obtained. Pruned stock of each class is identical in survival and growth while unpruned seedlings have made the best growth but show poorest survival. 1914 was a particularly dry, severe summer. Planting was done May 20.

No work on this section was reported from the other nurseries.

Plans for Further Work:

The 1914 plantations will be observed in the spring and fall of 1915 and 1916 before conclusions are drawn.

An additional experiment for testing the merits of unpruned seedlings and seedlings pruned in place will be installed at Priest River in the spring of 1915 to more thoroughly investigate the mechanical possibilities of pruning in this manner.

Planting tests of pruned and unpruned seedlings and transplants will be installed at the Trapper Creek nursery in the spring of 1915 and followed through two or three seasons. This may also be done at Savenac if the stock is available, or in connection with other planting experiments.

Use to be Made of Results:

In nursery and planting work.

Probable Date of Completion:

1916 for present series of tests; possibly one or two years longer for new series of beds installed 1915.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Yellow Pine Nursery Practice, Fn-101, D-1.

Section (j), Time and Method of Transplanting.

Object:

To determine the best time and method of transplanting western yellow pine.

Cooperation:

Savenac and Trapper Creek Nursery.

Location:

Priest River Experiment Station and Savenac and Trapper Creek Nurseries.

Status:

Proposed new section; nothing yet done.

Plans for Further Work:

Working plan to be prepared based on present knowledge of the subject gained from practical experience and work will be undertaken if expansion in planting program is made.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (a), Amount of Seed to Sow.

Object:

To determine the amount of seed to be sown in the seed beds.

Cooperation:

Savenac Nursery:

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments planned at Savenac in 1913 but were not carried out because of poor germination in the beds.

Ten beds were sown with different amounts at Savenac in May, 1914. Only partial germination has occurred the first season. The stand does not correspond except in a very general way to the amount of seed sown, owing to several possible causes. It will not be possible to tell until the fall of 1915 how closely density in white pine beds can be controlled by varying the amount of seed sown.

Plans for Further Work:

Second season observations on the 1914 beds at Savenac with subsequent transplanting and field tests in accordance with the working plan.

Use to be Made of Results:

In Nursery work:

Probable Date of Completion:

1918 (To installation of field tests according to working plan); 1923 to end of 5 years of annual counts.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - -

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (b), Time of Sowing.

Object:

To determine the best time of sowing seed in seed beds.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments at Priest River in 1912 and 1913 indicate that germination is greater during the first season from fall sown beds but that by the end of the second season germination in the spring sown beds is the greatest. The experiments were not complete enough to be conclusive but check with general observations at Savenac Nursery.

In 1914 an experiment was conducted at Savenac to determine the best part of the spring to sow. Plots of 2000 seeds each were sown May 1, May 15 and June 1, two plots on each date and two plots of 1000 each were sown May 23 in connection with project Fn-102 (b). Table shows results:

Date : Progress of Germination in Percents: Total Germination
Sown : Before 6/23: 6/23 to 8/8: After 8/8 : Number: Percent :

May 1	15.0%	65.0%	20.0%	140	7.0%
	12.0	62.0	26.0	101	5.0
May 15	3.1%	60.0%	36.9%	97	4.8%
	0.0	61.0	39.0	105	5.2
May 23	0.0%	56.5%	43.5%	39	3.9%
	0.0	70.0	30.0	30	3.0
June 1	0.0%	67.0%	33.0%	138	6.9%
	0.0	57.0	43.0	155	7.7

No clear points have been brought out by this experiment the first season and no conclusions can be drawn until the main part of the germination takes place next season.

Another series of plots was sown to contrast fall and spring in unprotected beds, 9/1 and 10/1, 1913 and May 1, May 15 and June 1, 1914, at Savenac. 500 seeds were used and the

following results were obtained:

Date of Sowing	Total Germination 1914	Percent of Germination
Plot 1, September 1, 1913	195	39.0%
Plot 2, October 1, 1913	141	28.2%
Plot 3, May 1, 1914	54	10.8%
Plot 4, May 15, 1914	32	6.4%
Plot 5, June 1, 1914	42	8.4%

Germination in the September plot was 100 percent complete and in the October plot 96.5 percent complete by June 1, which was 15 days before the first germination occurred in the spring sown plots. Germination in the spring sown plots continued throughout the season as in the other series.

Seedlings germinating after August 15 are so poorly developed as to be unable to live through the winter in most cases. The fact that from 20 to 40 percent of spring sown germination occurs after August 8 and that fall sown germination is complete by June 1 is a strong argument in favor of fall sowing from a standpoint of survival and development. Late summer and fall germination of white pine appears to be largely a waste which accompanies spring sowing. Whether this disadvantage is overcome by a considerably larger total germination and survival the second season in the spring beds, as has been thought, will be learned after another season's observations.

Experiments in project Fs-102 (e) at Priest River give a comparison of fall and spring sowing. Time and duration of germination in the fall and spring beds checked closely with results at the Savenac. To show the effect of time of germination on development some measurements are of interest:

Month of Germination:	Percent: Germin.:	Percent: Surviv.:	Length: Root:	Length: Stem:	Length: Leaf:	Diam.of: Stem:	Average Weight.
Fall sown	#	##					
Apr.-May	82.8%	83.0%	6.5"	1.8"	0.50"	1.1mm	0.124gm
June	15.4%	95.0%	5.5"	1.5"	0.45"	1.1mm	0.098 "
July	1.8%	100.0%	5.3"	1.5"	0.39"	1.0mm	0.073 "
Spring Sown							
Apr.-May	13.8%	82.0%	6.2"	1.2"	0.40"	1.0mm	0.079gm
June	33.3%	60.7%	6.1"	1.0"	0.36"	0.9mm	0.062 "
July	28.6%	56.0%	5.5"	1.0"	0.39"	0.9mm	0.059 "
Aug.-Oct.	24.3%	85.0%	3.0"	0.8"	0.19"	0.9mm	0.030 "

Percent of Total Germination germinating during each month

Percent of Each month's germination surviving in late October.

Germination in the fall bed was largely over by the time germination in the spring bed had well started and the addi-

tional length of the growing season had very marked effects on producing larger, heavier plants in the fall bed. In fact this larger size was characteristic not only of the April-May seedlings but also of the June and July seedlings, which might be partly attributed to slight differences in fertility, shade, etc. affecting the two beds.

Survival of the fall sown seedlings was noticeably better than of those germinating in the same months (June and July) from the spring sowing, but this also might be due to the fact that the fall bed was not shaded and the spring bed had half shade for the entire season. Contrary to the general impression gained at the Savenac, the seedlings germinating in August, September and October show a high percent of survival at the end of the season, although very much smaller than those which germinated earlier. The spring counts will show to what extent these late seedlings survived the winter.

Plans for Further Work:

To obtain a further comparison of fall and spring sowing, and also to obtain figures on comparative germination in greenhouse and nursery for fall sowing, in case it is used in practical nursery work, two plots of 1000 seeds each were sown in November, 1914 at Priest River and will be duplicated in the spring. This work is classed under project Fs-102 (b).

Stratification and seed stimulation experiments under project Fs, 102 (e) will also furnish further information.

Stock raised in the 1913 and 1914 experiments will be followed through a growth test in the transplant beds to determine effect of time of sowing on vitality.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1916; changed from 1915 to provide for growth tests,

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Wn-102, D-1.

Section (c) (New) Preliminary Treatment of Seed.

Object:

To determine the effect of different methods of grading seed upon size, development, vitality and growth after planting of seedlings and transplants raised in the nursery for field planting.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and Savenac Nursery.

Object:

No work has been done on this proposed section.

Plans for further work:

Seed grading is considered one of the most important problems connected with nursery practice since it affects the success of field planting so vitally. Experiments under project Wp-102 (b) have shown that size and development of stock have a very close relation to survival and growth when planted in the field. It is therefore very important to discover all of the methods of nursery practice that will aid in giving a more exact control of size and development so that, when the right kinds of plants for field planting have been determined, it will be possible to produce in the nursery the exact type of plant desired.

There is much evidence to indicate that seed grading has not only a bearing on the establishment of plantations but that it may also have an important effect upon the rate of growth and the quality and amount of the final yield. It is an established principle in agricultural and horticultural science that desirable qualities such as good form, large size, rapid growth, etc., can be transmitted through the seed and that grading and selection of seed is one of the principal commercially practicable means of increasing yield by the elimination of undesirable plants. There is every reason to believe that this principle can be applied to

the raising and planting of coniferous seedlings with very important and far-reaching results.

The Committee strongly advises the initiation of experiments under this section and recommends that a working plan be prepared during the coming winter covering a series of experiments to be started in the spring of 1915.

Use to be made of Results:

In Nursery and Planting work.

Probable Date of Completion:

Indefinite: observations necessary on field tests until maturity to determine effect of grading on yield.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (d), Depth of Covering Seed.

Object:

To determine the depth to which seed should be covered in the seed beds in order to produce the best results.

Cooperation:

Savenac and Boulder Nurseries.

Location:

Priest River Experiment Station and Savenac and Boulder Nurseries.

Status:

Experiments in 1912 and 1913 in connection with project Fs-102 (b) at Priest River, Savenac and Boulder gave the same germination for 1/4 and 1/2 inch at Priest River and Boulder but showed twice as much germination at 1/2 inch in the savenac plot. This may have been due to some unknown accident such as seed being eaten by mice or other condition.

Four beds sown at Savenac in the spring of 1914 were divided into plots covered 1/4, 3/8, 1/2, 5/8 and 3/4 inch, with sand. Two beds were sown in drills and two broadcast. The first season's results are shown in the following table:

Depth of: Average-Drill Beds: Average-Broadcast: Av.-Drill & Bdcst.						
Sowing : Survival: % of Loss: Survival: % of loss: Survival: % of loss						

1/4 in.	180	25.5%	252	15.2%	216	19.6%
3/8 "	148	26.6%	234	20.1%	191	22.6%
1/2 "	111	31.5%	106	39.6%	108	35.5%
5/8 "	87	44.6%	80	46.3%	84	45.3%
3/4 "	62	77.4%	49	69.8%	56	74.0%

This experiment demonstrates very clearly that for the first season in spring sown beds the least depth--1/4 inch--is best, both from the standpoint of highest germination and smallest loss, and that 3/8 inch is almost as good, while the greater depths show a rapid decrease in survival and increase in percent of loss from damping off, as the depth increases.

Since germination in these plots is still quite incomplete, the results of the second season must be awaited before drawing conclusions. There is every reason to believe, however, that the relations shown the first season will hold substantially true the second season. It is therefore recommended that sowing in the spring of 1915 be done at a depth not over $3/8$ inch nor less than $1/4$ inch.

Plans for Further Work:

Observations on the 1914 beds will be continued through another season, at the end of which time, measurements of development will be made and the experiment concluded.

No further work is planned in connection with this section although opportunities of checking the results may come up later from time to time in connection with other projects.

Use to be Made of Results:

In nursery work:

Probably date of Completion:

1915.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (e), Methods of Sowing.

Object:

To determine the best method of sowing in the nursery bed.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments started in 1911 and 1912 at Priest River were inconclusive.

Four beds sown at Savenac in the spring of 1914 were divided into plots covered $1/4$, $3/8$, $1/2$, $5/8$, and $3/4$ inch, with sand. Two beds were sown in drills and two were broadcasted. The first season's results are shown in the table:

<u>Depth of: Average-Drill Beds: Average-Broadcast: Av.-Drill & Bdest.</u>						
<u>Sowing : Survival: % of Loss: Survival: % of Loss Survival: % of Loss</u>						
$1/4$ in.	180	25.5%	252	15.2%	216	19.6%
$3/8$ "	148	26.6%	234	20.1%	191	22.6%
$1/2$ "	111	31.5%	106	39.6%	108	35.5%
$5/8$ "	87	44.6%	80	46.3%	84	45.3%
$3/4$ "	62	77.4%	49	69.8%	56	74.0%

At the lesser depths of $1/4$ and $3/8$ inch, which are clearly the depths which produced the best results, the broadcast beds showed superiority in a larger and more rapid germination and in a smaller percent of loss from damping off, over the drilled beds. At $1/2$ inch the methods show very little difference, while at the greater depths of $5/8$ and $3/4$ inch, the drills show a slight superiority in number germinated and in a smaller percent of loss. This is probably due to the fact that seed in drills can exert a combined lifting force upon a relatively small amount of covering material, thus cracking it in a long line above the drills, if there is any tendency to become compact, and allowing more of the weaker seedlings to reach the surface than is the case with broadcasted seed.

Since depths greater than 1/2 inch will probably not be used in the future sowing of white pine, the evidence on hand is distinctly in favor of broadcast sowing. Definite conclusions cannot be drawn, however, until the end of the second season as the larger part of the germination will probably take place at that time.

April 17, 1914, two beds were sown at Priest River, one in drills and the other broadcast. The results are shown in the following table for the first season:

 Month of :Percent:Percent:Length:Length:Length:Diam.of:Average
 Germination:Germin.:Surviv.: Root : Stem : Leaf : Stem :Weight
Broadcast Bed

May	13.8%	82.0%	6.2"	1.2"	0.40"	1.0mm	0.079gm
June	33.3%	60.7%	6.1"	1.0"	0.36"	0.9mm	0.062 "
July	28.6%	56.0%	5.5"	1.0"	0.39"	0.9mm	0.059 "
Aug.-Oct.	24.3%	85.0%	3.0"	0.8"	0.19"	0.9mm	0.030 "

Drilled Bed

May	12.0%	73.0%	6.5"	1.2"	0.49"	1.1mm	0.104gm
June	29.0%	35.7%	6.3"	1.1"	0.40"	1.0mm	0.076 "
July	38.5%	60.2%	6.1"	1.0"	0.40"	0.9mm	0.065 "
Aug.-Oct	20.5%	83.0%	2.8"	0.9"	0.21"	0.9mm	0.027 "

Both beds were given half shade during the entire season. Germination in the broadcast bed was somewhat faster than in the drills and was about 1/5 greater for the season. Survival was on the whole better in the broadcast bed than in the drills. On the other hand, the drill bed produced noticeably larger and heavier seedlings than did the broadcast bed. Difference in density may account for this since, in the sections of the beds from which the measured stock was taken, there were only about half as many drilled seedlings as broadcasted and the less dense plants had much more light and room than the others. The average densities per square foot were,--broadcast,--78; drills,--41, (one 4-foot drill being considered equal to 1 square foot when 3 inches apart).

This experiment tends to confirm the work at the Savenac in indicating that broadcast sowing is the best method for white pine. Records must be taken for another season before conclusions can be drawn, however.

Plans for Further Work:

Records will be continued at Priest River and Savenac on the 1914 beds in 1915, including final measurements. Stock will be followed through the transplant bed in a growth test.

Use to be Made of Results:

In Nursery work.

Probable date of Completion:

1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, p p - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (f), Fertilizing.

Object:

To determine the value of various mulches and manure fertilizers in seed and transplant beds as well as the time of application.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments at Savenac Nursery in 1913 with various combinations and strengths of nitrate of soda, dried blood, bone meal, and sheep manure. Applications of 2 pounds dried blood and 1 pound bone meal proved best for the seed beds and 1 pound of blood applied to 15 feet of transplant row showed best results on transplants. Nitrate of Soda caused injury.

Since good results were obtained from the 1913 experiments and since yellow pine germination was so much more prompt than white pine, the 1914 experiments were confined to yellow pine with the idea that the results would be applicable also to white pine. The 1914 experiments with yellow pine strongly confirmed the 1913 conclusions that a nitrogenous fertilizer was the only kind which benefitted the plants and that dried blood or animal meal was the cheapest and most satisfactory form of nitrogen to use for the purpose. Three pounds blood or five pounds animal meal were found to give equally good results at about the same cost. Freight is higher on the animal meal but this is offset by the considerable amount of phosphates contained.

Plans for Further Work:

No further work planned at present.

Use to be Made of Results:

In Nursery work

Probable Date of Completion:

1915.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (g), Shading.

Object:

To determine the effect of different degrees of shade on germination and development of seedlings and hardiness of trees when placed in the field.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments in 1913 at Savenac indicated that shading was a distinct advantage to white pine, 1/2 shade being slightly better than 1/4 shade.

In 1914 six beds were sown at Savenac, 2 beds were given no shade, 2 beds were given 1/4 shade and 2 beds were given 1/2 shade during the entire growing season. The first season's work strongly indicates the following points:

1. During the germinating period in May and June before the hot dry weather starts, beds having no shade show the largest and most rapid germination.

2. During the hot dry weather from July 1 to August 15, the shaded beds show larger germination and less loss from damping off and sun-scorch. 1/4 shade leads in this respect with 1/2 shade about intermediate between 1/4 shade and no shade.

3. With the coming of cooler weather in the latter part of August and early September, germination in the unshaded beds again takes the lead, shade appearing to act as check. 1/2 shade checks germination slightly more at this period than does 1/4 shade. Since plants germinating at the end of the season are in poor condition to pass the winter, it is probable that 1/2 shade or an even heavier degree could be used to advantage to discourage germination until the following spring.

4. Seedlings grown under shade are slightly taller and larger than those grown in unshaded beds, there being little difference between 1/4 and 1/2 shade in this respect. No differences in color, bud development, or thriftiness between the three degrees of shading were noticed.

Observations during 1915, when the greatest germination is to be expected, will throw more light on the points at issue.

Plans for Further Work:

The 1914 beds will be observed during 1915, at the end of which season measurements of development will be made. Growth tests in transplant beds will then be made to determine the effect of shading upon subsequent vitality of the plant.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (h), Watering.

Object:

To determine the amount and intervals of watering seed beds as well as the effect of substitution of cultivation for watering of seed and transplant beds.

Cooperation:

Savenac Nursery:

Location:

Savenac Nursery and Priest River Experiment Station.

Status:

Experiments started at Savenac Nursery in 1913.

Measurements were made of the stock from the 1913 experimental beds. These were 8 in number treated as follows:

- | | | | | |
|----|----------------|-------|------------|-----------------|
| 1. | 2 beds watered | 1 qt. | per sq.ft. | every other day |
| 2. | 2 beds " | 1 " | " " " | " " fourth day |
| 3. | 2 beds " | 2 " | " " " | " " fourth day |
| 4. | 2 beds " | 4 " | " " " | " " week. |

In size and weight, series (1) plants were largest, the others gradually becoming smaller in the order given. The most frequently watered stock (No. 1), was noticeably larger than the others, but No. 2 showed larger and better development than No. 3, although it received only half as much water. It was noticed at the time of taking up the plants that one bed of each of series 1 and 2 showed better development than its mate. It was further noticed that these two beds (Beds 5 and 6) showed distinct traces of rotted manure which was not seen in any of the other beds. It seems probable therefore that the increased size of the stock in series 1 and 2 was due in part to the presence of greater fertility as well as to the amount of water received. Omitting the two manured beds from the comparison, however, series 1 and 2 were slightly larger and heavier than series 3 with series 4 noticeably smaller than the others so that the evidence still indicates that the lighter and more frequent watering produces the larger and heavier stock. Series 4 showed somewhat longer as well as lighter roots, indicating that infrequent watering causes the roots to go deeper for moisture and results in a failure to develop as many short lateral roots as is the case with more frequent watering. Nothing definite was shown as to the effect of different amounts of water.

Owing to the evident interferences of differences in soil

fertility in this experiment the work was closed without conducting any growth tests in transplant beds or field planting.

In an attempt to determine the value and practicability of keeping a record of the amount of water applied to the seed beds for the entire nursery, the amount of water thrown by sprinklers was measured in inches of precipitation for 40 different set-ups, under varying conditions of wind, pressure, etc. A number of complicating factors were encountered, the principal ones being as follows:

1. Strong winds frequently prevented equal distribution of the water, causing twice as much water to fall to leeward as to windward of the sprinkler.

2. Three different makes of sprinklers (all of the same general type, however, were in use and all gave a little different distribution and amount.

3. In late summer much trouble is caused by the clogging of the sprinklers with weed seeds which ripen along the open water supply ditch and are swept into the pipes.

4. Occasionally a decrease in pressure was caused by the collection of leaves and trash against the wire screen at the intake of the pipe system.

5. The pressure and amount of water thrown from a sprinkler varied noticeably with the number of sprinklers in operation. This ranged from 1 to 8 and was seldom constant for any length of time.

6. The amount of water admitted to the ditch from Savenac Creek and the amount of water from the ditch for irrigating transplants both affected the pressure at the sprinklers.

Plans for Further Work:

No further work is planned with specific experiments but measurements of distribution of water will be continued for one or two more seasons before being dropped.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year, 1915-16, - - - - - \$ _____

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (1), Root Development.

Object:

To develop by means of methods of preparation and treatment of seed beds, root pruning, and transplanting, a root system favorable to successful planting.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

No work on this section has yet been done with white pine.

Plans for Further Work:

As soon as stock is available at Savenac, (probably in 1915), a field test will be made of transplants which have been pruned at time of transplanting and not pruned when transplanted. 2-year-old seedlings which have been pruned in place with a spade and not pruned will also be tested.

Use to be made of Results:

In nursery work.

Probable date of Completion:

1908; if field tests are installed as planned.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (j), Time and Method of Transplanting.

Object:

To determine the best season and best part of the season for transplanting.

Cooperation:

Savenac and Boulder Nurseries.

Location:

Priest River Experiment Station and Savenac and Boulder Nurseries.

Status:

Experiments at Savenac in 1913, transplanting on May 17, June 2 and June 16 showed best results for May 17. Transplanting August 15, September 1, September 15, and October 10 showed only 4 percent loss for earliest. This indicates that work can be done within wide limits if necessary. At Boulder fall transplanting showed heavy loss from heaving.

1000 1-year-old seedlings were transplanted at Savenac in 1914 on following dates: April 24, May 1, May 9, May 20, May 30, June 12, June 19, June 30, and July 14, while an additional lot from the same bed was left in the seedbed as a check. Observation for another season will be desirable before drawing definite conclusions, but the first season's work indicates the following points:

1. Transplanting in the spring should be done as early as possible and in any case before the buds have started.
2. Transplanting at the time the buds are swelling and rapid stem growth is under way (characteristic of the four lots from May 20 to June 19) check growth very suddenly and produces a noticeably stunted, unthrifty plant at the end of the season.
3. Transplanting after stem growth has slackened or stopped (characteristic of June 30 and July 14 lots) is less stunting in its effect but causes greatest mortality and causes a yellow unthrifty appearance at the end of the season.
4. Seedling stock of the same age and source of seed makes better growth and has a thriftier appearance than the best of the transplants, at the end of the first season.
5. Stock transplanted before growth starts (characteristic of April 24, May 1 and May 9 lots) made small height growth compared to some of the later lots but had a very healthy dark-green color and longer second-year needles than those transplanted later. The April 24 and May 1 lots were the most

thrifty. 1914 was an early season so that is probable that transplanting can be done in more backward seasons a little later than May 1 and even up to May 15 before the buds have started to swell and so as to still secure the best results.

6. The most striking result of the test was the difference between plants transplanted May 9 and May 20. The former were large and vigorous at the end of the season while the latter were dwarfed and very yellow and unthrifty-looking. The explanation of this is that practically none of the May 9 lot had started growth above ground (although the roots had started by April 200, while the May 20 lot was in the midst of active growth, two-thirds of the buds being wholly open with new needles commencing to develop.

Plans for Further Work:

The 1914 transplantings will be observed through another season and measurements of development made. It may be considered advisable at that time to carry them further into a field plantation as a final check on the effect of transplanting at different periods upon the vitality of the plants.

No further experiments are planned since the 1913 work demonstrated the possibilities of fall transplanting and the 1914 work covers spring transplanting thoroughly.

Use to be Made of Results:

In Nursery work.

Probable date of Completion:

1916; if field tests are installed, date will be 1918.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western White Pine Nursery Practice, Fn-102, D-1.

Section (k), Methods of Retarding Spring Growth of Nursery Stock.

Object:

To determine the best method of handling nursery stock for spring transplanting or field planting.

Cooperation:

Savenac Nursery.

Location:

Savenac Nursery.

Status:

Results at Savenac in 1913 indicate clearly that heeling in over winter is a bad practice if it can be avoided because of loss of vitality and set back of growth.

In 1914 2-0 seedlings and 1-2 transplants were taken up on April 30, May 8 and May 22 and one lot of each stored in the Savenac root cellar and one lot of each heeled in near the creek under dense shade of spruce in as cool a place as possible on each date. One lot of the same stock was taken up June 5 and, together with the lots stored and heeled in, was planted on a northerly slope near the nursery. A total of 15 plots were planted involving the setting of 5100 plants. 3 rows out of each 5 were staked with white painted lath for future intensive counts.

The first season's results on the 1914 work indicate that both heeling in and storage had a more or less injurious effect on the vitality of the plant. Storage was more efficient in retarding growth than was heeling in. Further counts will be desirable before drawing conclusions.

Plans for Further Work:

A detailed progress report will be prepared during the winter. Counts will be continued for two more seasons and possibly longer.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1917; changed from 1916 to allow additional count.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Douglas Fir Nursery Practice, En-161, D-1.

Section (g), Shading.

Object:

To determine the effect of different degrees of shade on germination of seedlings and hardiness of trees when placed in the field.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Experiments at Priest River in 1913 indicate that the best germination and survival of Douglas fir is obtained under 1/4 shade.

Experiment was conducted at Priest River in 1914 to check the 1913 results. Germination in the unshaded beds proved to be larger and somewhat more rapid than in the shaded beds during May and June but less rapid during July. Survival was best in the unshaded bed but almost as good in the 1/4 shade bed. There was practically no difference in size between the stock under the different degrees of shade.

It seems probable that Douglas Fir at Priest River should not be shaded during May and June but should receive 1/4 shade from July 1 to the middle of September.

Growth tests are being conducted in the transplant beds which may yield some additional information.

Plans for Further Work:

Survival and development records will be obtained at time of field planting from the growth tests in the transplant beds.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1916.

Assignment:

Officer in charge of Priest River Experiment Station

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Douglas Fir Nursery Practice, Fn-161, D-1.

Sections (a), (b), (c), (f), (i), (j), and (k).

Object:

Same as given under these sections under other projects.

Cooperation:

Bernice nursery.

Location:

Priest River Experiment Station and Bernice experimental nursery.

Status:

Proposed new sections: nothing yet done.

Plans for Further Work:

Work on these sections is proposed for the purpose of determining the best nursery practices with Douglas fir in connection with the planting being done in the eastern part of the District. It will be undertaken as soon as a nursery is established at the Bernice area on the Deerlodge Forest and nothing will be done unless the proposed expansion of the planting work is put into effect.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Section (a), Amount of Seed to Sow.

Object:

To determine the amount of seed to be sown in the seed beds.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

This section was omitted from the 1914 program by oversight but work was planned for it in working plan.

In 1914, four beds were sown with different amounts of larch at Savenac and records kept for the season.

Germination was very low and unsatisfactory, due in most part to the fact that the seed used (Colville, 1911) had deteriorated very rapidly during the few months previous to sowing. This same poor germination was noted in the case of other 1914 experiments in which this seed was used. It is possible that additional germination will occur next spring from seed which has lain dormant. Unless there is a considerable amount of such germination, however, this series of beds will be of no value in the study of amount to sow because of the very incomplete stand and small density.

Plans for Further Work:

The 1914 beds will be observed through 1915.

An attempt will be made in 1915 to secure some fresh larch seed of good quality, with which a series of fall sown beds will be sown with different amounts to obtain further information on the effect of density.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1918; provided for a 2-year growth test in transplant beds.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Section (b), Time of Sowing.

Object:

To determine the best time of sowing seed in the seed beds.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Experiments begun in 1913 at Priest River. May 1 or earlier appeared to be the best time for spring sowing.

The work in 1914 with larch pointed strongly to the conclusion that fall sowing would give better results than spring sowing. Fall sown seed germinates mostly in May with a very small balance in June, while seed sown early in May does not start to germinate until July and continues actively through August. In the case of seed sown in June, 1913, the seedlings which germinated in May, 1914 (and the percent of this germination was quite heavy) were practically as large and well developed at the end of their first season as were those which germinated in July and August of the previous year. Measurements show the July and August seedlings resulting from spring sown seed to be very much smaller and less able to stand the winter than are those which germinate in May. There is a high mortality during the winter and early spring among the late germinating seedlings owing to their small size which makes them very susceptible to heaving and their generally poor development.

To obtain more data on fall and spring sowing, one plot of larch was sown in November 1914 to be compared with a similar plot to be sown in April, 1915.

Plans for Further Work:

Observations will be made of the fall and spring plots during 1915, in connection with project Fs-141 (b),

It is hoped to be able to secure some fresh larch seed in 1915 which can be used for a further series of experiments to be conducted in 1916 in connection with project Fs-141 (b).

No specific work on this section will be carried on.

Use to be Made of Results:

In Nursery work.

Probable date of Completion:

1916; changed from 1915 to provide for an additional series of tests in 1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice Fn-141, D-1.

Section (d), Depth of Covering Seed.

Object:

To determine the depth to which seed should be covered in the seed beds in order to produce the best results.

Cooperation:

Savenac and Boulder Nurseries.

Location:

Priest River Experiment Station and Savenac and Boulder Nurseries.

Status:

Experiments in 1912 in connection with project Fs-141 (b) at Priest River, Savenac and Boulder, indicated that 1/4 inch was the most favorable depth, with 1/2 inch almost as good. Experiments at Priest River indicated that depths from 1/4 to 1/2 inch were about equally good, the former or least depth being slightly better. 3/8", being an average between the two, was thought to be a safe standard to use, with allowable variation between 1/4 and 1/2 inch, the lesser depth to be slightly favored.

3/8 inch was used in all 1914 sowing but no experiments were conducted to test out other depths.

Plans for Further Work:

No further work is planned on this section. A final report on the work done will be issued during the coming winter.

Use to be Made of Results:

In nursery work:

Probable Date of Completion:

1915; changed from 1917 for above reasons.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Section (e), Methods of Sowing.

Object:

To determine the best method of sowing in the nursery bed.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Experiments begun at Priest River in 1913. These indicated that germination was better in drills but that survival was slightly better in broadcast plots. Results were not entirely conclusive, however.

No work was done in 1914 on this section.

Plans for Further Work:

If fresh seed can be obtained in 1915, a series of beds will be sown in the fall, part broadcast and part drills. Germination will be watched and stock will be followed through one season in the transplant beds.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1917; changed from 1915 to provide for an additional series of tests.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Section (g), Shading.

Object:

To determine the effect of different degrees of shade on the germination and development of seedlings and on the hardiness of trees when placed in the field.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Experiments at Priest River in 1913 indicated that the best germination and survival of larch was obtained under 1/2 shade.

Experiments at Priest River in 1914, to check those of 1913, showed no great differences between the three degrees of shade (no shade, 1/4 and 1/2). The unshaded bed started a little (2.0%) in June but by the end of July a larger percent of germination had occurred in the other beds, the 1/2 shade being in the lead. 1/2 shade led in germination and survival throughout the germinating months of July and August, thus checking with the 1913 work. No large or consistent differences were shown in development of spring sown seedlings. The seedlings which germinated in May and June from the 1913 sowing were considerably larger than those germinating in July and August and those having no shade were very noticeably larger and better developed than those under 1/4 shade, as shown in table:

Degree of Shading	Month of Germination	Length of Root	Length of Stem	Length of Leaf	Diameter of Stem
No shade	May, 1914	6.9"	1.2"	0.60"	1.1 mm.
	June "	6.0"	1.1"	0.43"	0.9 "
1/4 shade	May, 1914	5.4"	1.2"	0.38"	0.7 mm
	June, "	4.9"	0.9"	0.31"	0.7 "

The work to date indicates the following procedure for securing the best results:

1. For spring sowing, shades should be left off until July

1 and 1/2 shade given for the rest of the growing season.

2. For fall sowing, larch probably should not be shaded at all, although it may be found later that light shade during the hot, dry weather from July 15 to August 15, will be of benefit.

Plans for Further Work:

If fresh larch seed can be obtained in 1915, it is planned to install a series of three beds, shaded 1/2, 1/4 and no shade, half of each bed to be sown in the fall and half in the early spring. This will be in connection with section (b) of this project and will furnish data on both time to sow and degree of shade and their relations with each other. Stock will be transplanted and growth tests carried on for two years in the transplant beds.

Use to be Made of Results:

In nursery work:

Probable Date of Completion:

1918; changed from 1916 to provide for additional tests.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice. Pn-141. D-1.

Section (h). Watering.

Object:

To determine the amount and intervals of watering seed-beds as well as the effect of substituting cultivation for watering seed and transplant beds.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Experiments started at Priest River in 1913 but results were not conclusive for the first season.

The 1913 beds were observed in 1914 and given a differentiation in treatment as follows:

Bed 11. No watering but cultivation after each rain.

Bed 12, Watering equivalent to 0.75 inches per week in one weekly application with frequent cultivation.

Bed 13, Heavy watering, equivalent to 1.50 inches per week in two applications per week; no cultivation.

Rainfall was computed from the rain-gage readings and included within the amount received by each bed per week.

Measurements of the stock were taken at the end of the season and showed very noticeable differences in size;

00000000000000000000000000000000

Bed :Treatment Received: Length of:Length of:Length of:Diamter:
Numb: : Root : Stem : Leaf :of Stem:

11	Cultivation only	8.5"	1.6"	0.61"	1.3 mm
12	Light watering and cultivation	7.3"	1.2"	0.48"	1.1 "
13	Heavy watering only	6.5"	0.9"	0.34"	0.8 "

The stock from bed 11 was uniformly about $1/3$ larger than that from bed 13, while stock from bed 12 was almost exactly half way between the other two.

This experiment seems to indicate that larch does best with a relatively small amount of moisture such as is made available by conserving the rains by means of surface cultivation. Soil moisture samples taken weekly during the summer showed that the lowest moisture percent reached by the soil in the core from 1 to 6 inches (in which most of the roots were

located) was 14.5% on September 1, after a continuous dry period of seven weeks. The previous week the 1 to 6 inch core showed 17.0% moisture and the three weeks before that 22.4%, 26.8% and 32.1%, respectively. With the exception of September 9, which was 15.1%, all other figures for this depth were between 38.0% and 61.0%. The deeper samples uniformly showed more moisture than the 1 to 6 inch core. 40.0% was the minimum reached by the soil from 1 to 6 inches in the watered beds during the season.

Since most plants can exist for weeks in soil whose moisture is less than 15.0% it is seen that at no time did the moisture in bed 11 become dangerously low and that with the exception of 2 weeks at the end of the season the percentage was always above 20.0% which is considered sufficient for good growth of almost any mesophytic plant, and during most of the time was above 40.0% which is probably more moisture than larch can make good use of.

The fact that 1914 was an exceptionally hot, dry summer makes this study even more interesting and indicates that on the Priest River nursery site 2-year-old larch seedlings require no artificial watering if given surface cultivation, although watering during the dry period might have been slightly beneficial. It also indicates that heavy watering of larch on the Priest River silt soil is not advisable at any time.

Plans for Further Work:

Stock taken from the 1913-14 beds has been transplanted and will be followed through the transplant beds as a test of growth and vitality.

No other experiments are planned.

Use to be Made of Results:

In nursery work.

Probable Date of Completion:

1916; changed from 1915 to provide for 2-year test in transplant beds.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Larch Nursery Practice, En-141, D-1.

Section (1), Root Development.

Object:

To develop by means of methods of preparation and treatment of seed beds, root pruning, and transplanting, a root system favorable to successful field planting.

Cooperation:

Savenac Nursery and Section of Planting.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

The working plan for the project on "Root Development" did not provide for any work with larch and nothing has been done.

Plans for Further Work:

Since root development is being studied in connection with western white pine and yellow pines, it is thought that the information obtained could be applied to larch since such a small amount of it was being grown.

If the proposed expansions of the forestation studies is approved it will probably be desirable to do work on this section in order to obtain accurate data for use in case large quantities of larch are raised in the future and work will be planned and started as soon as the necessary seed or stock is on hand.

Use to be made of Results:

In nursery work.

Probable date of Completion:

Indefinite; depending upon time seed and stock is available.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Section (j), Time and Method of Transplanting.

Object:

To determine the best season and best part of the season for transplanting.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

No work has been done on this section, since it was not included in the working plan for "Time of Transplanting."

Plans for Further Work:

In the fall of 1914 larch was transplanted at Priest River in connection with another project and this will be repeated in the spring of 1915 with similar stock. By arranging this spring work to be done on several dates as May 1, May 15, June 1, June 15, and July 1, this work can be made to furnish data on time of transplanting of larch and the plans will provide for this procedure.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

1916; changed from 1915 to provide for two years duration of tests in the transplant beds.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western Larch Nursery Practice, Fn-141, D-1.

Sections (c), Preliminary treatment of Seed, and (f), Fertilizing.

Objects:

Same as those sections under other projects.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Proposed new sections; nothing yet done.

Plans for Further Work:

Proposed in connection with the expansion of the forestation work in order to make the work with larch comprehensive. Plans for the work will be drawn and work started as soon as fresh seed can be obtained.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Engelmann Spruce Nursery Practice, Fn-146, D-1.

Section (a), Amount of Seed to Sow.

Object:

To determine the amount of seed to be sown in the seed beds.

Cooperation:

Savenac Nursery:

Location:

Savenac Nursery.

Status:

Experiments carried on at Savenac in 1913 which gave valuable indications as to approximately the best density to use in growing Engelmann spruce.

No further work has been done on this section, since the species is a rather unimportant one in nursery management and the figures obtained in 1913 were thought to be sufficient for practical use in raising the small amount of Engelmann spruce, now raised at the savenac.

Plans for Further Work:

It is thought that additional and thorough work should be done on this section before dropping it, since this species may become very important in future planting operations for mixture with white pine. If the proposed expansion in the forestation work is approved a new series of experiments will be planned and undertaken when seed is available.

Probable date of completion.

1920, if experiments can be started in 1915 and 1916.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Engelmann Spruce Nursery Practice, Fn-146, D-1.

Sections b, c, f, g, i, j, k.

Objects:

Same as for these sections given under other projects.

Cooperation:

Savenac Nursery:

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Proposed new sections, nothing yet done.

Plans for further work:

Proposed in connection with the expansion of the forestation work; if approved, plans will be drawn and work started as soon as seed can be obtained.

Use to be made of Results:

In nursery work.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Red Cedar Nursery Practice, Fn-182, D-1.

Sections a, b, d, e, f, g, h, i, j, titles same as under other projects.

Objects:

Same as for same sections under other projects.

Cooperation:

Savenac Nursery.

Location:

Priest River Experiment Station and Savenac Nursery.

Status:

Proposed new project and sections, nothing yet done.

Plans for Further Work:

Proposed if new expansion in planting work is made; plans will be drawn and work started as soon as seed is obtained.

Use to be made of Results:

In nursery work.

Probable Date of Completion.

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - 4 _____

Project:

Western Yellow Pine Sowing and Planting, Fp-101, D-1.

Section (b), Comparison of Different Classes of Stock.

Object:

To determine the most desirable age, kind, and size of stock for field planting.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station and Coeur d'Alene, Deer-lodge, Lolo, and Bitterroot Forests.

Status:

Work started at Priest River in 1912 and at Placer Creek area on Coeur d'Alene Forest in 1913. Priest River work indicated that yellow pine seedling stock was superior to transplant stock on the score of growth, survival, and cost per living seedling, with one or two inconsistent exceptions.

An experiment with three plots in the fall of 1913 at Priest River to determine the effect of sorting stock into large, medium, and small sizes was repeated in the spring. Results for the first season (an exceptionally dry, severe one) follows:

Size of Stock	:Season :Planted	:Survival :June, 1914	:Survival: :Oct. 1914:	Growth in: 1914	Height :Oct. 1914
# Large	Fall, 1913	85.0% of 400	63.5%	1.1"	5.1"
Medium	Fall, 1913	81.0% of 400	53.0%	0.7"	4.2"
Small	Fall, 1913	78.0% of 400	50.5%	0.5"	3.5"
Large	Sprg. 1914	97.5% of 400	87.0%	0.8"	4.6"
Medium	Sprg. 1914	95.0% of 400	71.5%	0.6"	3.9"
Small	Sprg. 1914	92.0% of 400	70.0%	0.4"	3.2"

Both fall and spring stock was 1-2, Idaho from Savenac.

As was to be expected the large stock was superior both in survival (10% for fall and 15% for spring planting) and in season's growth; the medium stock being slightly but consistently better than small in both respects. These relations may be changed as the plantations become older.

Six plots of 400 plants from Bitterroot seed raised at Priest River were planted in the fall of 1913 and spring of 1914, 3 plots being 2-0 seedlings and 3 plots being 1-1 transplants. The results after the first season are shown below:

Age-class:	Season	Survival	Survival	Growth in:	Height
:	Planted	: June, 1914	: Oct. 1914:	1914	: Oct. 1914
2-0 not pruned	Fall, 1913	96.0% of 400	93.5%	1.4"	5.9"
1-1 not pruned	Fall, 1913	96.5% of 400	87.0%	1.0"	4.5"
2-0 not pruned	Sprg, 1914	95.0% of 400	72.0%	1.8"	5.0"
1-1 not pruned	Sprg, 1914	--- " "	80.0%	1.1"	3.7"
2-0 pruned "	"	98.0% " "	86.0%	1.3"	4.0"
1-1 pruned "	"	--- " "	86.0%	1.3"	4.1"

In the fall planting, the 2-0 seedlings show 5.0% greater survival and have been making better growth than the 1-1 transplants. In the spring planting, the 2-0 and 1-1 pruned stock is identical while the 2-0 unpruned is lower in survival but has made better growth than the 1-1 not pruned. On this showing and considering the much smaller cost of the 2-0 seedlings, that stock must be considered superior to the 1-1 transplants for planting on medium sites at Priest River. The second season may show changes in these relationships, however.

The experiments with yellow pine age-classes installed in 1912 on two different sites show much the same relationship as reported in 1913. The 4 lots of Helena stock planted on Benton Flat in the spring of 1912 gave the following record:

Age	No of	Survival	Survival	Growth	Height	Cost per:
Class:	Plants:	Fall-1913:	June-1914:	Oct-1914:	1914	: 1914 :Surviv. :
2-1	98	93%	93%	92%	6.4"	14.4" .0077
Trspt.						
1-1	84	93%	87%	86%	3.4"	10.4" .0063
Trspt.						
2-0	76	85%	83%	83%	3.5"	8.4" .0033
Seedl.						
1-0	85	81%	76%	75%	2.8"	5.9" .0029
Seedl.						

100 plants were planted in each case but the number killed by accident causes such as mounding by gophers has been deducted.

On the basis of survival alone, the transplants are ahead

but considering the cost and the comparatively high survival of the seedling stock, particularly the 2-0, the latter must be considered equal if not superior to the transplants.

The seven lots of 100 each planted on a south slope site, in the fall of 1912 showed the following condition in 1914:

Age : Survival in Percent Plants: Growth: Height: Cost : Cost per
 Class : Fall-1913: June-1914: Oct-1914: 1914 : 1914 : per M: Plant #:

2-0 Seedl.							
Bitterroot	93%	88%	87%	1.8"	6.0"	2.91	.0033
1-0 Seedl.							
Bitterroot	91%	85%	80%	0.8"	3.1"	1.65	.0021
1-2 Trspl't.							
Helena	79%	70%	67%	1.6"	4.7"	4.65	.0069
1-1 Trspl't.							
Idaho	71%	68%	64%	1.2"	3.1"	3.27	.0051
2-1 Trspl't.							
Helena	78%	67%	64%	1.1"	4.4"	3.27	.0051
1-1 Trspl't.							
Helena	77%	63%	62%	0.6"	3.3"	3.27	.0053
2-1 Trspl't.							
Idaho	61%	58%	57%	0.8"	3.7"	3.27	.0057

#Nursery cost per surviving plant, fall of 1914, (Savenac Nur.)

In this test the 2-0 seedlings are noticeably superior in both survival and growth as well in low cost, with 1-0 seedlings second in everything but growth. The 1-2 transplants lead the other transplants in survival and growth with 1-1 and 2-1 transplants next and the balance following closely. What difference the source of seed has made in this test cannot be determined but other conditions were as uniform as it was possible to make them using only 100 plants per plot spaced 5x5.

In the fall of 1914, 4 plots of .8 acre apiece, containing 960 plants spaced 6x6, were planted on a southwest slope at Placer Creek, using Bitterroot stock raised at Savenac Nursery of the following classes, - 2-0 fertilized; 2-0 unfertilized; 1-1 transplants; 1-2 transplants. All plants were staked and the experiment will be closely followed.

Plans for Further Work:

Observations will be made in 1915 upon all the experiments started. Experiments comparing 2-0, 1-2 and 1-1 stock will be installed at Priest River in the spring of 1915. More experiments will be put in at Placer Creek as opportunity offers. This

is considered the most urgent and important planting project and should not be dropped until several different series of tests have indicated substantially the same facts for different seasons, sources of seed, and sites.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1920; changed from 1917 to provide five years counts on 1915 installations; progress reports will be issued yearly.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - -

Project:

Western Yellow Pine Sowing and Planting, Fp-101, D-1.

Section (c), Season for Sowing and Planting.

Object:

To determine the best season for yellow pine reforestation.

Cooperation:

Savenac and Trapper Creek Nurseries.

Location:

Priest River Experiment Station, and Coeur d' Alene, Deer-lodge, Lolo and Bitterroot Forests.

Status:

Work was begun at Priest River in 1911 and on Coeur d'-Alene Forest (Placer Creek) in 1913.

1-2 Idaho-transplants raised at Savenac were installed at Priest River in the fall of 1913 and spring of 1914. The figures (given on page 1 of Section (b), indicate very decidedly that spring planting is superior to fall planting, average survival for spring work being 72.8% and for the fall work 55.5%. 400 plants were used per plot and three plots each season, planted $2\frac{1}{2}$ by $2\frac{1}{2}$ feet in adjacent and exactly similar plots. The stock all came from the same nursery, the same source of seed and approximately the same transplant bed and the handling and planting were done by the same men and by the same method.

2-0 and 1-1 stock raised at Priest River from Bitterroot seed was planted in the fall of 1913 and spring of 1914. Survival at the end of 1914 averaged 76.0% for the spring planting and 90% for the fall planting. This was not primarily an experiment to determine best season and the spring stock was not taken up until May 20, several days after its buds had opened and active stem growth had started. It is known that transplanting stock when in this condition does not produce as good results as when plants are dormant so that the comparison between the dormant plants in the fall and the growing plants in the spring is misleading and cannot be considered as having a true bearing on this problem.

The planting experiments installed in 1911 and 1912 indicate that early spring planting is better than fall planting. They also indicate that spring sowing of seed in seedspots and broadcasting gives better results than fall sowing.

Plans for Further Work:

Whenever opportunity offers, in connection with other

sections of this project, new experiments will be installed which will furnish additional information on the best season to plant and sow yellow pine. At the end of another season a progress report will be issued covering the records up to that time.

Large scale experiments will be installed at Placer Creek and Bernice experimental planting areas as soon as opportunity permits and can probably be started in the fall of 1915 to some extent.

Use to be Made of Results:

In reforestation:

Probable Date of Completion:

1917 for present installations; later for installations made in 1915 and after. This is an involved problem, the solution of which will require a great many series of tests on different sites and under different conditions and definite and final conclusions cannot be drawn until several series of tests check each other and all point to substantially the same facts.

Assignment:

Officer in charge of Priest River Experiment Station:

Proposed Expenditures:

Fiscal Year 1915-16, - - - - - \$ _____

Project:

Western Yellow Pine Sowing and Planting, Fp-101, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field as well as the best spacing for plants both in pure plantations and in mixed plantations with other species.

Cooperation:

Savenac and Trapper Creek Nurseries, and Office of Planting in the District Office.

Location:

Priest River Experiment Station and Coeur d'Alene, Deerlodge, Lolo, and Bitterroot Forests.

Status:

Work started at Priest River in 1911 and continued in 1912 and 1913, a total of 22 separate experimental units being included in the study of different methods of sowing and planting.

Several large scale plots were installed by Office of Planting at Placer Creek experimental area on the Coeur d'Alene Forest in spring of 1913 but no survival counts have yet been reported and the success is not known. These plots were staked with painted lath stakes in the fall of 1914 and will be followed closely in the future.

In the work so far, seedspot sowing and planting have proved far superior on every count to ~~complanter~~ and broadcast sowing and it is thought that work on the latter two methods may be definitely discontinued. Planting has shown best results of any method for most conditions and appears to be on the whole the cheapest and most dependable method of reforestation. Work with seedspot sowing cannot be considered finished, however.

Plans for Further Work:

When opportunity permits further experiments with seedspot sowing and with various refinements and improvements in the details of planting work will be conducted at Priest River and at the experimental planting areas on the different Forests. A progress report on the work to date will be issued during the coming winter.

Use to be Made of Results:

In reforestation work.

Probable Date of Completion:

1917 for the present installations; later for new installations. The work cannot be considered finished until a large mass of data has been collected comprised of several series of tests which check each other consistently. It is impossible, with the present overloaded program and small force and facilities to carry on, from year to year, more than a fraction of the work which is necessary to complete the project. Its final conclusion must therefore be considered indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Yellow Pine Sowing and Planting. Fp-101, D-1.

Section (c), Effect of Cover.

Object:

To determine the effect of the various kinds of cover found on the planting sites of District 1 upon the planting of Western yellow pine.

Cooperation:

Section of Planting.

Location:

Priest River Experiment Station, Placer Creek and Bernice Experimental planting areas.

Status:

Proposed new section; nothing yet done.

Plans for Further Work:

If proposed plans for expansion in planting work are approved, plans will be drawn and work started in connection with the planting experiments with this species. Considerable data can be obtained from the study of old plantations.

Use to be made of Results:

In reforestation.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - -

Project:

Western Yellow Pine Sowing and Planting, Fp-101, D-1.

Section (f), Sites Suitable for Planting.

Object:

To determine the suitability of various situations for reforestation with western yellow pine, such as humus soils east of the Cascades, slopes covered with old brush, brush fields, etc.

Cooperation:

Savenac and Trapper Creek Nurseries and Office of Planting in the District Office.

Location:

Priest River Experiment Station, and Coeur d' Alene, Deerlodge, Lolo and Bitterroot Forests.

Status:

Work begun at Priest River fall of 1911 and spring of 1912 and continued fall of 1912. Work at Placer Creek area on Coeur d'Alene Forest started by the Office of Planting in spring of 1913. No counts have been reported on this work and its success is not known.

The work at Priest River has compared a typical southwest slope in the yellow pine type with a sandy larch flat at the foot of the slope. In the case of planting the larch flat shows slightly better survival and growth on an average but in some individual cases the southwest slope leads. Success from sowing has been noticeably greater on the flat both in survival and in amount of growth.

Plans for Further Work:

One trouble with the previous comparisons has been that stock from a far away nursery had to be used and differences in treatment and handling were bound to creep in to the results. In 1915 several thousand plants will be available from the nursery at Priest River. Plots of these will be placed on different sites in connection with reforestation of the fall places on the Experiment Station area and in the course of two or three seasons should furnish fairly comprehensive comparisons.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1917.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Sowing and Planting, Fp-102, D-1.

Section (b), Comparison of different classes of stock.

Object:

To determine the most desirable age, kind, and size of stock for field planting.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene and Lolo Forests.

Status:

Work begun in fall of 1912 at Priest River and continued in the spring and fall of 1913 and spring of 1914.

The age classes planted in the fall of 1912 show the following results. Stock was all from the Savenac Nursery and was planted uniformly by the same crew on the same site, 100 per plot.

Age Class and :Survival in Percent of Plants:Growth:Height:
Source of Seed :Fall-1913:June-1914:Oct.-1914: 1914 : 1914 :

Fall, 1912, Planting.

2-0 Seedl. Lolo	85%	78%	77%	1.7"	4.7"
2-1 Trspl't. Idaho	67%	58%	57%	1.7"	5.5"
1-1 " "	64%	64%	59%	0.9"	3.0"

Spring, 1913, Planting

1-0 Lolo, Exp.Sta.Nurs.	89%	80%	80%	1.1"	2.6"
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Here the 2-0 seedling stock is noticeably in the lead in survival and has made the same growth as the 2-1 transplants. Of the transplants, the 1-1 shows slightly better survival but less growth than the 2-1. The record of the 1-0 seedlings planted in the spring, although not exactly comparable with the others, is interesting in itself as it shows that no loss whatever occurred during the exceptionally dry period in 1914 and that the stock made good growth, better than the 1-1 stock and not far behind the other classes, in its second season. What difference the source of seed has made cannot be determined

but other conditions were quite uniform. Even excluding the question of cost, which would of course give the seedlings a very great lead, the seedling stock in this experiment has proved superior to the transplants.

To determine the effect of pruning the roots of stock at time of planting, two plants of 100 each of 2-1, Idaho, stock from the Savenac nursery were planted in the fall of 1912. The results are as follows:

Treatment of Roots	:Survival in Percent of Plants:		:Growth:		:Height:	
	:Fall-1913:	June-1914:	Oct.-1914:	1914 :	1914 :	
Roots not pruned	79%	77%	67%	1.3"	3.6"	
Roots Pruned to 5"	69%	64%	63%	1.7"	3.8"	

The stock not pruned shows greatest survival but lost more heavily in the dry season of 1914 than did the pruned stock. The latter made the best growth.

To determine the effect of sorting general run stock from the Savenac Nursery into large, medium with well developed roots, medium with poor roots, and small stock, 400 of each were planted in the fall of 1913 and again in the spring of 1914. The results for the first season are given in the following table:

Size Classification:Season		:Survival in Percents:		:Growth:		:Height:	
1-2, Idaho Stock		:Planted:	June-1914:	Oct.-1914 :	1914 :	1914 :	
Large stock	Fall	96.0%	86.0%	0.9"	2.8"		
Large Stock	Spring	99.0%	82.5%	0.5"	3.1"		
" "	Average	97.5%	84.8%	0.7"	3.0"		
Medium, Good Roots	Fall	90.0%	83.0%	1.1"	3.5"		
Medium, Good Roots	Spring	99.0%	81.0%	0.4"	2.6"		
" " "	Average	94.5%	82.0%	0.8"	3.1"		
Medium, Poor Roots	Fall	98.0%	89.5%	0.9"	3.0"		
Medium, Poor Roots	Spring	96.0%	72.5%	0.4"	2.7"		
" " "	Average	97.0%	81.0%	0.7"	2.9"		
Small Stock	Fall	58.0%	36.0%	0.3"	2.4"		
Small Stock	Spring	96.5%	69.5%	0.2"	2.6"		
" "	Average	77.3%	52.8%	0.25"	2.5"		

In selecting this stock 20 bundles, containing approximately 2000 plants just as they were taken up from the nursery were used for obtaining the 1600 necessary plants for the experiment. The division into classes ran about as follows:

Large Stock	Medium, Good Roots	Medium Poor Roots	Small Stock
20 percent	30 percent	25 percent	25 percent

The average of the two seasons probably gives the truest idea of the effect of size and development upon survival and growth. As was to be expected, the large class takes the lead, but the two medium classes are practically as good both in survival and growth. The small class shows a very sudden drop, however, to 1/3 of the medium classes in growth and 2/3 of the medium classes in survival. The average survival for the four classes when figured according to the percentage of each class in 2000 would be 75.0%. By the omission of the small class the average survival would be 82.5%. Taking an arbitrary nursery cost per thousand of \$3.00 for 1-2 stock, the throwing away of the 25% small would increase the cost of the remainder to \$3.75 per M. Thus if the 25% small were sorted out the cost per surviving seedling would be .0045 while if the small were left in this cost would be .0040 or \$0.50 per M (surviving) less than if stock were sorted.

If it is found that the surviving small stock recovers eventually and makes as good growth as the other classes, it would not pay to cull. If, however, the small stock lags behind in development consistently over a period of years after planting, it may be a paying investment to cull out the smaller and weaker plants before planting, even at an additional cost of from 50¢ to \$1.00 per thousand. Later counts may show a change in the relationships of the classes.

In the fall of 1914, four plots containing 680 plants per plot, spaced 6x6, were planted on the Placer Creek area on the Coeur d'Alene Forest. All stock was from Lolo seed raised at the Savenac nursery and one plot was planted with each of the following age classes: 2-0, 1-1, 2-1 and 1-2. Each plant was staked with a painted lath and the work will be followed very closely.

Plans for Further Work:

Counts on the age and quality class experiments already started will be continued for several more seasons before drawing conclusions.

New installations of several different age classes of white pine are planned for the spring of 1915. A new experiment will be started to determine the effect of sorting out various percentages of the smaller plants from a very small to a large proportion b. 10 percent divisions.

This problem is considered one of the most urgent and important forestation studies in the program and will be continued and pushed at every opportunity until unquestionable facts are obtained by the substantial concurrence of several

different series of tests in different seasons and under different conditions.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Western White Pine Sowing and Planting, Fp-102, D-1.

Section (c), Season for Sowing and Planting.

Object:

To determine the best season for western white pine re-forestation.

Cooperation:

Savenac Nursery and the Office of Planting.

Location:

Priest River Experiment Station, Coeur d'Alene and Lolo Forests.

Status:

Work was started at Priest River in 1911 and 1912. Plots were sown in the fall and spring by broadcasting, cornplanter, and seedspots and 2-1 stock was planted.

In the fall of 1912 3 plots of 400 each were planted by different methods and one 1/4-acre plot was sown broadcast, one with 200 cornplanter spots, and one with 200 prepared seed-spots. Two other plots were also sown with 100 prepared seed-spots each. Those plots which furnish an exact comparison of seasons are given below in the following table:

Method Used: Season and : Survival in Percent: Growth: Height:
: Year Installed: June-1914: Oct.-1914: 1914 : 1914 :

Planting (2-1)	Fall-1911	61%	59%	3.1"	7.1"
"	(2-1) Spring-1912	59%	58%	3.3"	7.6"

Method Used : Season : Stand in Percent Spots or Per Acre :
: and Year: Fall-1913 : June-1914 : Oct.-1914 :

Broadcast	Fall-1911	148 per A.	187 per A.	195 per A.
"	Sprg-1912	374 " "	583 " "	705 " "
Seedspots	Fall-1911	21 perc't.	19 perc't.	23 perc't.
"	Sprg-1912	41 " "	47 " "	47 " "
"	Fall-1912	60 " "	65 " "	66 " "

In the comparison of classes of stock section of this project a rather extensive comparison between fall and spring planting was obtained in which 1600 1-2 transplants of the same source were planted on adjacent plots in the fall of 1913 and spring of 1914.

Size Classification: Season: Survival in Perc'ts: Growth: Height:
1-2, Idaho Stock : Planted: June-1914: Oct.-1914: 1914: 1914 :

Large Stock	Fall	96.0%	86.0%	0.9"	2.8"
Medium, Good Roots	"	90.0%	83.0%	1.1"	3.5"
Medium, Poor Roots	"	98.0%	89.5%	0.9"	3.0"
Small Stock	"	58.0%	36.0%	0.3"	2.4"
Average for Fall		85.5%	73.6%	0.8"	2.9"
Large Stock	Spring	99.0%	82.5%	0.5"	3.1"
Medium, Good Roots	"	99.0%	81.0%	0.4"	2.6"
Medium, Poor Roots	"	96.0%	72.5%	0.4"	2.7"
Small Stock	"	96.5%	69.5%	0.2"	2.6"
Average for Spring		97.6%	76.4%	0.4"	2.7"

Except in the case of the small stock, the fall work is slightly superior to the spring planting and it is thought conditions in this experiment were about as uniform as it is possible to make them in field planting operations. The fact that fall planting is definitely better than spring planting is not established but it seems probable that it is fully as good and that fall planting operations with white pine are entirely justified whenever stock and other conditions are available for the work. Other planting work with white pine in the fall of 1912 and 1913 in which 2000 plants were used in five plots of 400 each and which show an average survival at the end of the first season of 92.1% for the 1912 work and 91.5% for the 1913 work and of 88.1% at the end of the second season for the 1912 work indicate that very good results can be obtained in fall planting.

200 plants planted on a steep northeast slope in the spring of 1914 which show at the end of a severe season a success 98.0% also indicates that spring work can be done with great success.

Plans for Further Work:

Observations will be continued on the work installed and as opportunity permits new experiments will be installed in connection with other sections of the project in order to check the results already obtained for other seasons and conditions. A progress report will be issued in the fall or winter of 1915 giving the details of the work to date.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Sowing and Planting, Fp-102, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field as well as the best spacing for plants both in pure plantations and in mixtures with other species.

Cooperation:

Savenac Nursery and the Office of Planting.

Location:

Priest River Experiment Station and Coeur D'Alene and Lolo Forests.

Status:

Work was started at Priest River in the fall of 1911 and spring of 1912 and continued in the fall of 1912 and spring and fall of 1913 with various methods of planting and sowing. The results of the most reliable sowing experiments are as follows; all of them put in in the fall of 1912:

Method of: Amt. Seed : Survival in % of Spots or No. per acre
Sowing : Numb. Spots: Fall of 1913 : Spring of 1914: Fall of 1914

Broadcast	7 lbs p A.	232 per A	304 per A	320 per A
Cornplanter [#]	200 spots	7.0%	8.0%	9.5%
Seedspots [#]	200 "	59.5%	59.0%	59.0%

[#]Seed used at the rate of 1 pound per acre containing 800 spots.

If seed costs \$2.00 per pound, it takes an investment of \$14.00 for seed alone to get the poorly distributed partial stand of 320 per acre in the broadcast plot. The cornplanter plot is clearly a failure, largely because mice cleaned out the spots soon after sowing. The seedspots were not so badly damaged by rodents and have made a definite success. Sowing in prepared spots is the only method that has proved successful at Priest River and it has yielded an average success at the end of the second season of 66 percent of spots sown, most of the spots containing several seedlings. This was from fall sowing. Spring sowing has not yet been fully tried out owing to lack of good seed. The one plot installed gave a success of 47% of spots, after three seasons.

Five plots of 400 plants each have been installed to determine if there is any differences due to method of placing plants in the ground. Three of these were installed in the fall of 1912 and 2 in the fall of 1913. The present results are shown in the following table:

Method Used : Stock : Season : Survival in Percent : Growth : Height :
 : Used : Planted : June-1914 : Oct.-1914 : 1914 : 1914 :

Single Slit	2-1 Idaho	Fall 1912	88.2%	82.0%	1.6"	4.6"
Side of Hole	2-1 Idaho	Fall 1912	95.0%	95.0%	1.2"	3.9"
Careful Cone	2-1 Idaho	Fall 1912	87.2%	87.2%	1.1"	3.7"
Prepared Slit	1-2 Idaho	Fall 1913	94.0%	90.0%	0.6"	3.5"
Prepared Side of Hole	1-2 Idaho	Fall 1913	97.0%	93.0%	0.7"	3.3"

The general conclusion to be drawn from this group of experiments is that in fall planting in deep, moist soil, the main thing is to get the roots firmly in contact with the soil and pointing downward and the plant at the proper height. If this is done it matters very little whether the dirt is lifted from the hole as in the side of hole and cone methods or whether it is merely opened up as in the slit methods so that the plant can be placed in the proper position. Firming carefully with the fingers as in the cone method is no better than firming quickly with the feet as in the slit and side of hole methods.

The "prepared" slit and side of hole methods differ from the "Unprepared" in that in the former the ground to be planted is first loosened up with three or four blows of the mattock before the slit or hole is made and the side of the slit or hole against which the plant is held when firming is done has been loosened or cultivated instead of being of undisturbed compactness as in the single slit and the ordinary side of hole methods. The experiments do not show any particular benefits from this preliminary preparation and it of course decreases the speed of the crew perceptibly. Another season may show a different relationship. In the meantime the "prepared" side of hole method will be used as in 1914 for all planting work. The hand mattock method of planting in use in the regular District planting operations in 1913 and 1914 is a combination of the ordinary slit and side of hole methods and the above results show that its use on deep moist soils will secure as good results, if carefully supervised, as any slower and more careful method.

Plans for Further Work:

No further work is planned on detailed method of placing plants in the ground except possibly in connection with the attempt to establish white pine on difficult southerly sites.

The fresh 1914 white pine seed will furnish another opportunity to experiment with different methods of sowing and some plots will be installed in the fall of 1915 and spring of 1916 to check the results obtained from sowing.

A progress report on the work to date will be issued at the end of 1915, and the working plan will be revised to provide for additional experiments planned.

Large scale tests will be established at Placer Creek to compare different methods in the fall of 1915 and spring of 1916.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1917 for the present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Sowing and Planting, Fp-102, D-1
Section (e), Effect of Cover.

Object:

To determine the effect of the various kinds of cover found on the planting sites of District 1 upon the planting of western white pine.

Cooperation:

Section of Planting.

Location:

Priest River Experiment Station and Placer Creek experimental planting area.

Status:

Proposed new section; nothing yet done.

Plans for Further Work:

If proposed plans for expansion of planting work are approved, plans will be drawn and work started in connection with the other planting work with white pine; much data can be obtained from the study of old plantations.

Use to be made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Sowing and Planting, Fp-102, D-1.

Section (f), Sites Suitable for planting.

Object:

To determine the suitability of various situations for reforestation with western white pine.

Cooperation:

Savenac Nursery and the Office of Planting.

Location:

Priest River Experiment Station and the Coeur d' Alene and Lolo Forests.

Status:

Work was started in the fall of 1911 and spring of 1912 and continued in 1913 and 1914.

The principal results are shown in the following table:

Site Planted: Season : Stock: Survival in Percent: Growth: Height:						
: Planted: Used : June-1914: Oct.-1914: 1914 : 1914 :						

Site I, W.P.	F-1912	2-1	90.1%	88.1%	1.3"	4.1"
River Bench						
do	S-1913	1-0	80.0%	80.0%	1.1"	2.6"
do	F-1913	1-2	95.5%	92.0%	0.7"	3.4"
do	Average		88.5%	86.7%	2.1"	5.2"
Site II,	F-1913	1-2	85.5%	73.6%	0.8"	2.9"
Larch Flat						
do	S-1914	1-2	97.6%	76.4%	0.4"	2.7"
do	Average		91.5%	75.0%	0.6"	2.8"
Site III S.W.	S-1912	2-1	90.0%	89.0%	2.2"	5.8"
Slope						
Site I, N.E.	S-1914	1-2	99.5%	98.0%	0.5"	2.5"
Slope						
Site III West	"	1-2	90.1%	0.3%	---	---
S.W. and S.E.						

The site I planting has shown a consistent superiority

to the Site II work as was to be expected. The differences between these sites lies wholly in the soil, the former being a fine silt and the latter a sand, both being on flat benches.

The planting on site III in 1912 in a favorable season has shown up remarkably well and indicates that planting can be done on southerly slopes to advantage in ordinary moist seasons.

Planting in an unfavorable season such as 1914 tells a very different story, however, as shown in the last half of the table. Here the June counts a month or more after planting show that good establishment was secured but after the seven weeks of dry weather in July, August, and September, the plantations on southerly slopes were practically total failures while that on the Northeast slope was the most successful plantation yet established by the Station.

Plans for Further Work:

Counts on the 1913 and 1914 work will be continued for a few more seasons before drawing definite conclusions. The 1914 work should be checked by further plantations to see whether the same southerly slopes cannot be planted to white pine during more favorable seasons since natural white pine seedlings are found growing to some extent on these same sites in spots. A progress report will be issued in 1915 covering the details of the work to date

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1916 for the present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Douglas Fir Sowing and Planting, Fp-161, D-1.

Section (b), Comparison of Different Classes of Stock.

Objects:

To determine the most desirable age, kind, and size of stock for field planting.

Cooperation:

Savenac and Boulder Nurseries and Office of Planting.

Status:

A rather indirect comparison between 2-1 and 2-0 stock is obtained from the work on "Methods of Sowing and Planting" with this species at Priest River in 1911 and 1912. 2-1 stock was planted in the fall on two sites and 2-0 in the spring on the same sites, it being impossible to obtain any 2-1 stock for the spring work. The fall planting of 2-1 shows greater survival than the spring planting of 2-0, although the 2-0 plantations lead in amount of growth made. This comparison cannot be considered exact, however.

In the spring of 1913 plantations of Douglas fir were put in by the Office of Planting on the Placer Creek area on the Coeur d'Alene forest which may throw some light on this problem. No counts have yet been reported on this work and the success is not known.

Plans for Further Work:

Several classes of stock will be on hand at the Priest River nursery in 1915 and 1916 which can be used in local experiments and in experiments at Placer Creek area and if time and funds permit, these will be installed.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Douglas Fir Sowing and Planting, Fp-161, D-1.

Section (c), Season for Sowing and Planting.

Object:

To determine the best Season for Douglas fir reforestation.

Cooperation:

Savenac and Boulder Nurseries and Office of Planting.

Location:

Priest River Experiment Station, Coeur d' Alene, Deer-lodge and Lolo Forests.

Status:

Work at Priest River in fall of 1911 and spring of 1912. Experiments were of too small an extent to be conclusive but indicate that for both sowing and planting best results are obtained from work done in the fall.

No experiments have been installed at other places but the examination of old plantations being conducted jointly by the Experiment Station and the Office of Planting will probably furnish valuable information on the best season.

Plans for Further Work:

Stock will be available in the fall of 1915 for the installation of some tests at different places to compare fall and spring planting on a large scale and this will be done if time and funds permit.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1918; changed from 1917 to provide 3 years records for 1915-1916 installations.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Douglas Fir Sowing and Planting, Fp-161, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods for sowing and planting in the field as well as the best spacing for plants both in pure plantations and in mixtures with other species.

Cooperation:

Savenac and Boulder Nurseries and Office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene, Deerlodge, and Lolo Forests.

Status:

Work begun at Priest River in fall of 1911 and spring of 1912 in comparing different kinds of sowing with planting. Planting has proved much the surest and cheapest method of reforestation, although experiments were not complete enough to cover the ground thoroughly.

Some experiments were installed by the Office of Planting in the spring of 1913 at the Placer Creek area on the Coeur d'Alene Forest but no reports have been received and the success is not known. The examination of old plantations being conducted jointly by the Experiment Station and the Office of Planting should yield valuable information on this section.

Plans for Further Work:

No further experiments are planned for Priest River since this species is of relatively small importance at that Station. When stock is available experiments will be continued at Placer Creek and installed at the Bernice area on the Deerlodge Forest.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1917 for present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - -

Project:

Douglas Fir Sowing and Planting, Fp-161, D-1.

Section (f), Sites Suitable for Planting.

Object:

To determine the suitability of various situations for reforestation with Douglas fir.

Cooperation:

Savenac and Boulder Nurseries and Office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene, Deerlodge and Lolo Forests.

Status:

Work begun at Priest River in fall of 1911 and spring of 1912. Experiments covered a southwest slope in the yellow pine type and a sandy flat in the larch-Douglas fir type. Douglas fir grew naturally on both sites. The flat shows slightly higher survival but the south slope plants have made better growth.

Experiments on the Placer Creek area on the Coeur d'Alene Forest were installed by the Office of Planting in spring of 1913. No counts have been reported and the success is not known. The examination of old plantations being conducted jointly by the Experiment Station and the Office of Planting should furnish valuable information on this section.

Plans for Further Work:

No further work is planned at Priest River since Douglas fir is a relatively unimportant species and will not be used in the reforestation of the Experiment Station area. Stock will be available for further experiments at Placer Creek and the Bernice area on the Deerlodge Forest, in 1915 and will be planted if time and funds permit.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1917 for present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Larch Sowing and Planting, Fp-141, D-1.

Section (b), Comparison of different classes of stock.

Object:

To determine the most desirable age, size and kind of stock for field planting.

Cooperation:

Savenac Nursery and the office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene and Lolo Forests.

Status:

Age class experiments installed in spring of 1912 at Priest River indicated that 2-0 seedlings were more satisfactory than 1-1 or 2-1 transplants in survival and growth. This fact seemed quite clearly established and the space was needed for another experiment so the plots were discontinued in the fall of 1913, after two seasons.

Two plots, containing 100 each of 3-0 and 2-2 stock were planted on Block C in the fall of 1912. Their present condition is as shown in the following table:

Age Class:	Survival in Percent of 100 plants:			Growth in:	Height in
	Fall-1913:	Spring-1914:	Fall-1914 :	1914	Oct-1914
3-0 Seedl.	71%	66%	64%	1.5"	6.9"
2-2 "	80%	76%	70%	3.6"	10.4"

The older transplants in this experiment seems to have taken the lead both in survival and growth over the seedling stock. Considering the greater cost of the transplants of this class, however, over the seedlings, the latter have made a very good showing and are superior in cost per surviving seedling.

Plans for Further Work:

As soon as stock is available either at the Savenac or at the Experiment Station nursery more experiments along this line will be installed, probably in 1916 or 1917. Working plans will be prepared for the new work during the coming year, if possible.

Use to be Made of Results:

In reforestation.

Probable Date of Completion.

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Larch Sowing and Planting, Fp-141, D-1.

Section (c), Season for Sowing and Planting.

Object:

To determine the best season for western larch reforestation.

Cooperation:

Savenac Nursery and the Office of Planting.

Location:

Priest River Experiment Station and the Coeur d'Alene and Iolo Forests.

Status:

No experiments in comparing planting at different seasons have been started except in an indirect way during different years. Thus three different age classes planted in May, 1912, 2-0, 1-1, and 2-1, averaged in survival after two years 51 percent, while 3-0 seedlings and 2-2 transplants planted in the fall of 1912 averaged after two years 67 percent. This merely confirms what one would naturally suppose that fall would be the best season for planting larch since its buds open about April 1 in northern Idaho which is before it is usually practicable to plant. Other experiments have shown that planting or transplanting after the buds have opened and active stem growth has started causes a marked stunting and weakening of the plant which would be very liable in the case of spring planted larch to results in a greater loss than if the stock were planted in the fall while entirely dormant.

Sowing experiments installed with larch in the spring of 1913, fall of 1913 and spring of 1914 are not yet complete but indicate that practically no germination takes place the first season from spring sowing but that a fair germination is obtained the second season. From fall sowing a small germination is obtained the first season and it is not known yet what results will be secured the second season.

Plans for Further Work:

As stock becomes available at the Experiment Station nursery, experiments involving season for planting will be installed at Priest River to check present indications. This will also be done with sowing if fresh larch seed can be obtained.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Larch Sowing and Planting, Fp-141, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field as well as the best spacing for plants both in pure plantations and in mixtures with other species.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and the Coeur d'Alene and Lolo Forests.

Status:

Work at Priest River started in 1912 and continued in 1913 comparing planting with different methods of sowing.

No method of sowing has shown any success whatever and planting is thus the only practicable method so far discovered of securing western larch reforestation. The success secured with plantations is given in more detail in the previous sections (b), and (c), of this project.

Plans for Further Work:

If fresh seed can be obtained in 1915 new sowing experiments will be started to check the present results. As soon as stock is available at the Experiment Station nursery, planting experiments to check present data will also be started, probably in 1916.

Large scale experiments will be started at Placer Creek area also as soon as stock and fresh seed are available.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

1917 for present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16- - - - - \$ _____

Project:

Western Larch Sowing and Planting, Fp-141, D-1.

Section (f), Sites suitable for Planting.

Object:

To determine the suitability of various situations for reforestation with western larch.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene and Lolo Forests.

Status:

Work with larch started at Priest River in the spring of 1912 and continued in the spring and fall of 1913 and spring of 1914. Work has not yet been complete enough to give conclusive results but the indications are as follows:

1. For larch sowing site I, white pine river bench having a deep fine silt soil shows better results than site II, sandy larch bench.

2. For larch planting site I, white pine river bench shows better results than site II, sandy larch bench and much better results than site III, southwest slope which is almost a failure, showing only 30 percent after 3 years.

Plans for Further Work:

If fresh seed can be obtained in 1915 and stock is available, some experiments will be installed on different sites in the fall of 1915 and spring of 1916 in connection with the reforestation of the Experiment Station area. Such tests on a larger scale will also be installed at the Placer Creek experimental area on the Coeur d'Alene Forest.

Use to be Made of Results:

In reforestation:

Probable Date of Completion:

1917 for present installations; later for new work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Engelmann Spruce Sowing and Planting, Fp-146, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field as well as the best spacing for plants both in pure plantations and in mixtures with other species.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and Coeur d'Alene and Lolo Forests.

Status:

This species was included in the program largely for the purpose of studying its effect when planted in mixture with other and more intolerant species.

Experiments with mixed plantations of Douglas Fir and Engelmann spruce at different spacings were established by the Office of Planting in the spring of 1913. There has been no opportunity to make counts as yet but the plants were staked with painted lath in the fall of 1914 and counts will be kept annually from 1915 on.

Plans for Further Work:

Counts of plantations on Placer Creek will be made annually and the fall places will be kept filled at periodic intervals.

New plantations of mixtures containing Engelmann spruce will be made at Placer Creek and elsewhere from time to time. Working plans for this work will be prepared during the coming year.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite; changed from 1917 to allow several years observations on work already installed and to provide for the new experiments which will be installed from time to time.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - _____

Project:

Engelmann Spruce Sowing and Planting, Fp-146, D-1.

Sections b, c and e.

Objects:

Same as for these sections under other projects.

Cooperation:

Section of Planting.

Location:

Priest River Experiment Station and Placer Creek and Bernice Experimental Planting areas.

Status:

Proposed new sections: nothing yet done.

Plans for Further Work:

Will be started under proposed expansion of forestation studies and if approved plans will be made and work started as soon as stock is available.

Use to be made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Engelmann Spruce Sowing and Planting, Fp-146, D-1.

Section (f), Sites suitable for planting.

Object:

To determine the suitability of various situations for reforesting with Engelmann spruce.

Cooperation:

Savenac Nursery and the Office of Planting.

Location:

Priest River Experiment Station and the Coeur d'Alene, and Lolo Forests.

Status:

Some experiments which will give light on this problem were started at the Placer Creek area on the Coeur d'Alene Forest in the spring of 1913 by the Office of Planting in connection with the establishment of large scale plots of Douglas fir and Engelmann Spruce in mixtures at various spacings. Only one or two distinct sites were covered at that time but the data will be available for comparison with other sites when experiments including more are established. It has been impossible to make counts on these 1913 plantations to date but the plants have all been staked with painted laths and from 1915 on it will be possible to keep close records of them.

Plans for Further Work:

Annual observations on the plantations already established. New experiments to be started at Placer Creek whenever stock is available and opportunity permits. Working plan covering new installations will be prepared during the coming year.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite; changed from 1916 because conclusions on the present installations cannot be drawn for several years and new experiments will be added from time to time.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Siberian Larch Sowing and Planting, Fp-508, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Seed was received in 1912 and sown in the nursery. As soon as stock is large enough a plantation will be established. The nursery seedlings seem well adapted to the climate and have made good growth.

Plans for Further Work:

Establishment of field plantation and annual observations for a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Japanese Larch Sowing and Planting, Fp-507, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Plantation of 100 2-0 seedlings from Savenac Nursery planted on Block C, White pine river flat, fall 1912.

Survival in 1914, Spring, - - - - - 65.0 percent
Fall - - - - - 65.0 "

Condition in 1914, Growth - - - - - 1.4 Inches
Height- - - - - 5.4 "

Has been slow in becoming established and sensitive to handling in planting but gives some promise.

Plans for Further Work:

Fall places will be kept filled and observation made annually for a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

European Larch Sowing and Planting, Fp-506, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Plantation of 100 established in spring of 1912 on sandy larch flat.

Fall places replanted Fall of 1913.

Survival, fall of 1914, - - - - - 70.0 percent

Condition in 1914, Growth, - - - - - 4.9 inches

Height - - - - - 20.5 "

This species shows a sensitiveness to handling in planting but when once established seems to do well and make good growth.

Plans for Further Work:

Fall places will be kept filled and observations made annually for a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16, - - - - -

Project:

Norway Spruce Sowing and Planting, Fp-505, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

2 plots established in fall of 1911; one plot in the fall of 1913 and one plantation containing 6500 planted in the spring of 1914.

1. Plot of 100 on sandy larch flat, 2-0 stock, fall, 1911.
Survival in 1914, Spring, - - - - - 90.0 percent
Fall - - - - - 89.0 "
Condition in 1914, Growth, - - - - - 1.6 inches
Height, - - - - - 4.7 "
2. Two plots on block C, white pine river flat, 2-3 stock.
Survival in 1914, Spring, - - - - - 82.0 percent
Fall - - - - - 80.0 "
Condition in 1914 Growth - - - - - 2.2 inches
Height - - - - - 10.1 "
3. Plantation on Block C, white pine flat, 3-0, Boulder Nursery.
Survival in 1914, Fall Thrifty - - 61.0 percent
Unthrifty - 9.0 "
Dead - - - 30.0 "

The species has shown itself fairly well adapted to local conditions but shows sensitiveness in handling and becoming established. On dry sandy sites such as No. 1 the foliage turns a distinct yellowish color during the hot summers.

Plans for Further Work:

Fall places will be filled in on the small plots and annual observations will be made on all plantations for a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Austrian Pine Sowing and Planting, Fp-501, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Plantation of 100 1-1 plants established on sandy larch flat in spring of 1912.

Survival in 1914	Spring - - - - -	69.0 percent
	Fall - - - - -	69.0 "
Condition in 1914	Growth - - - - -	1.6 inches
	Height - - - - -	5.4 "

The species does not seem well suited to the climate or the site as it is making very slow growth and has a yellow, unhealthy appearance.

Plans for Further Work:

Fail places will be filled and annual observations maintained over a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Scotch Pine Sowing and Planting, Fp-500, D-1

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Plantation of 100 1-1 transplants established in the spring of 1912 on sandy larch flat.

Survival in 1914,	Spring - - - - -	55.0 percent
	Fall - - - - -	55.0 "
Condition in 1914	Growth - - - - -	7.2 inches
	Height - - - - -	14.7 "

Those plants which have become established are making good growth with a slight tendency to become bushy.

Plans for Further Work:

Fail places will be filled from Experiment Station Nursery and observations will be made yearly.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Incense Cedar Sowing and Planting, Fp-181, D-1

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Plantation of 100 installed in spring of 1912 on sandy larch flat.

Survival in 1914: Spring 70.0% Fall 70.0%

Average Growth, 1914: 0.7 inches

Average Height, 1914: 3.5 "

Plans for Further Work:

Annual observations on plot indefinitely.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Bigtree Sowing and Planting, Fp-177, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

100 plants installed fall 1912, 2-0, Savenac Nursery.

Survival in 1914, Spring - - - - - 53 percent
Fall - - - - - 53 percent

Condition in 1914 Growth - - - - - 2.4 inches
Height - - - - - 6.3 "

Now that it is established this stock is doing well, seeming to be well suited to climate and conditions.

Plans for Further Work:

Fill places will be filled and observations made annually for an indefinite period.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Sitka Spruce Sowing and Planting, Fp-148, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Seed was received in 1912 and sown in nursery. As soon as fairly good sized stock has been obtained a plot will be established on Block C in a favorable location.

Plans for Further Work:

Annual observations on plantations as soon as established. Fill places to be filled.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Loblolly Pine Sowing and Planting, Fp-111, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Seed received in 1912 and sown in nursery. As soon as stock is large enough, a plantation will be established.

In the nursery the species shows a marked tendency toward winter killing from the late frosts in the spring and early frosts in the fall and does not give much promise although it makes a rapid growth during the summer and shows good color.

Plans for Further Work:

Establishment of plantation and annual observations over a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion.

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Jeffrey Pine Sowing and Planting, Fp-108, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Seed received in 1913 and sown in nursery. Stock transplanted spring of 1914 and will be ready for planting in spring of 1916.

Species does very well in the nursery and transplant beds having good healthy color and making good growth.

Plans for Further Work:

Plantation will be established in 1916 and annual observations will be made for a period of years.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

White Pine Sowing and Planting, Fp-107, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station:

Status:

Three plots planted in the spring of 1912 and one plantation of mixed Norway Spruce and white pine, containing 2500 white pine 2-2 stock from the Savenac Nursery established in the spring of 1912. All work on Block C, white pine flat.

Plots on Block C:

Survival in 1914, Spring - - - - - 99.0%

Fall - - - - - 99.0%

Condition in 1914, Growth - - - - - 12.7 inches

Height - - - - - 34.7 "

The plantation of 2500 showed the following condition at the end of the first season:

Thrifty - - - - - 70.0 percent

Unthrifty - - - - - 15.0 "

Dead - - - - - 15.0 "

Plans for Further Work:

Fail places will be filled in present plantations and observations kept up annually.

New plantations will be established from time to time as stock becomes available.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - _____

Project:

Norway Pine Sowing and Planting, Fp-105, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station:

Status:

Four plots were planted in the spring of 1912 on Block C, white pine bench and on sandy larch flat.

1. Plot of 100 1-0 seedlings from Minnesota Forest.

Fall places filled fall of 1913.

Survival in 1914 Spring - - - - - 90.0 percent

 Fall - - - - - 89.0 "

Condition in 1914 Growth - - - - - 1.6 inches

 Height - - - - - 4.7 "

2. 3 plots of from 25 to 50 2-3 stock from Michigan, Block C.

Survival in 1914, Spring, - - - - - 73.0 percent

 Fall - - - - - 53.0 "

Condition in 1914, Growth - - - - - 3.5 inches

 Height - - - - - 11.6 "

This species does not seem as well suited to the climate as might be supposed but may do better after becoming established.

Plans for Further Work:

Fall places will be filled and observations made annually.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Sugar Pine Sowing and Planting, Fp-104, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or on situations where it does not naturally occur.

Cooperation:

Location:

Priest River Experiment Station.

Status:

Two plots of 100 were planted in the fall of 1911 but owing probably to freezing of stock in transit or other cause the work was a complete failure in the spring.

In the spring of 1914, one plot of 100 was planted on sandy larch flat and one plot of 400 was planted on white pine river bench. Stock was 2-2 and was raised at Savenac Nursery.

Survival in 1914, Spring - - - - - 86.8 percent
Fall - - - - - 57.0 "

Condition in 1914 Growth - - - - - 1.9 inches
Height - - - - - 4.2 "

The later planting shows considerable success, although in this case also stock was a long time in transit and heeled in before being planted.

Plans for Further Work:

Failed places will be filled from stock raised at Experiment Station and observations will be continued annually.

Use to be Made of Results:

In reforestation.

Probable Date of completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Hardwood Planting, Fp-300, D-1.

Section (a), Test of Species.

Object:

To test the suitability of the species in regions or in situations where they do not occur naturally.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station and Coeur d' Alene, Lolo, and Deerlodge Forests.

Status:

Fifty-five separate field installations have been made mostly on the favorable white pine river bench at Block C of the principal American and European hardwood timber trees. Practically all species which give any promise at all for use in northern Idaho are included either in the field plots or have been sown in the nursery and will be planted as soon as large enough. The plantations have been arranged along the main county road from the railroad to Priest Lake in such a way that they will excite comment and interest on the part of the large numbers of people that visit the lake each summer and thus advertise the work of the Station. These plantations in addition to their main purpose of making a field planting test will constitute an very interesting arboretum. Some of the species have suffered more or less from frost injury in this climate and there is considerable difference in the adaptability which they have so far shown. Considerable space would be required to go into this in detail so that it must be omitted from this report.

Plans for Further Work:

A progress report will be issued during the coming year and annual observations will be made on all plantations for a period of years or until they are clearly failures. Fail places will be kept filled as far as possible.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite:

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Lodgepole Pine Sowing and Planting, Fp-103, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field, as well as the best spacing to use both in pure plantations and in mixtures with other species.

Cooperation:

Boulder Nursery, Office of Planting and Deerlodge Forest.

Location:

Priest River Experiment Station and the Bernice Experimental area on the Deerlodge Forest.

Status:

No work has yet been started on this project. It was included in the program since experiments with this species were planned for the experimental area on the Deerlodge Forest.

Plans for Further Work:

If the proposed expansion of the forestation work is approved, plans will be made for conducting experiments at the Bernice area.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Lodgepole Pine Sowing and Planting, Fp-103, D-1.

Section (f), Sites suitable for planting.

Object:

To determine the suitability of various situations for reforestation with lodgepole pine.

Cooperation:

Deerlodge Forest and Office of Planting.

Location:

Priest River Experiment Station and Bernice area on the Deerlodge Forest.

Status:

No work has yet been started on this project. It was included in the program since experiments with this species were planned for the experimental area on the Deerlodge Forest.

Plans for Further Work:

Since it now appears doubtful whether there is any need of planting lodgepole on the Deerlodge, it would probably be best to drop this project from the program until such time as definite experiments with it seem to be desirable.

Use to be made of Results:

In reforestation.

Probable Date of Completion:

To be dropped from program before starting any work.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Lodgepole Pine Sowing and Planting, Fp-103, D-1.

Sections b, c and e.

Objects:

Same as for these sections under other projects.

Cooperation:

Bernice experimental area.

Location:

Bernice Experimental Area and Priest River Experiment Station.

Status:

Proposed new sections; nothing yet done.

Plans for Further Work:

Will be carried on in connection with proposed expansion of the forestation work. If approved plans will be drawn and work started as soon as stock can be raised.

Use to be made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Red Cedar Sowing and Planting, Fp-182, D-1.

Section (d), Methods of Sowing and Planting.

Object:

To determine the best methods of sowing and planting in the field, as well as the best spacing for plants both in pure plantations and in mixtures with other species.

Cooperation:

Savenac Nursery and Office of Planting.

Location:

Priest River Experiment Station, Coeur d'Alene And Lolo Forests.

Status:

No work has yet been started but this species was included in the program since it is planned to use it in mixed plantations with more intolerant species such as white pine with which it is associated in natural stands. These mixed plantations will be installed on the Placer Creek area on the Coeur d'Alene Forest and elsewhere as soon as stock is available. Seed of the species is difficult to get, however, and no stock is now on hand.

If there is a good seed crop in 1915, an effort will be made to gather enough to raise stock for these experiments.

Plans for Further Work:

Installation of mixed plantations as soon as stock is available. Preparation of working plan during coming year.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite; changed from 1917 because it is not known when plantations can be established nor records completed.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western Red Cedar Sowing and Planting, Fp-182; D-1.

Sections b, c, e and f.

Objects:

Same as for these sections under other projects.

Cooperation:

Section of Planting.

Location:

Priest River Experiment Station and Placer Creek Experimental Planting Area.

Status:

Proposed new sections, nothing yet done.

Plans for Further Work:

Will be carried on in connection with the proposed expansion of the forestation studies; work will be started as soon as plans are drawn and stock is available.

Use to be Made of Results:

In reforestation.

Probable Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Administrative Sowing and Planting Studies, Fp(ad)-1,D-1.

Object:

To determine by means of a thorough and comprehensive examination of the degree of success secured on the different field plantations of District 1 and the reasons for success.

Cooperation:

Section of Planting.

Location:

Planting areas of District 1.

Status:

Work was started on this project in the summer of 1914 and some thirty plantations were examined by a crew of from two to three men, using a strip reconnaissance method. The data obtained has not yet been worked up in complete shape for determination of results but it is known that much valuable data was obtained which will greatly help in checking the regular planting experiments.

Plans for Further Work:

This work will be carried on hand in hand with the more intensive planting experiments and the data obtained will be used in working up the various investigative projects and sections concerned.

Use to be made of Results.

In reforestation:

Probable Date of Completion:

Continuous.

Assignment:

Officer in charge of Priest River Experiment Station and Chief of Planting.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$2000.00

Project:

Volume Growth and Yield of Douglas Fir, ME-1, D-1.

Object:

To complete the data on volume, growth and yield of this species.

Cooperation:

Office of Silviculture.

Location:

Forest of District 1.

Status:

No strictly investigative work done since 1912; more or less information obtained by reconnaissance crews each summer in volume and empirical yield in connection with reconnaissance work.

Plans for Further Work:

No further work planned by investigative force. Reconnaissance crews will gather information indefinitely in an administrative way.

Use to be made of Results:

In volume and yield tables.

Probable Date of Completion:

Indefinite; recommended to be dropped from the program as an investigative project.

Assignment:

Local Forest forces under direction of District Office.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - Nothing

Project:

Volume, Growth and Yield of Lodgepole Pine, ME-2, D-1.

Object:

To secure further data on volume, growth, and yield for this species on sites for which present data is insufficient.

Cooperation:

Office of Silviculture.

Location:

Deerlodge National Forest.

Status:

Yield tables for even-aged stands on favorable sites submitted in lodgepole tree study report; Work begun in 1912. No report for 1914 has been received; some reconnaissance data obtained on volume and empirical yield.

Plans for Further Work:

Continuation of measurements until all sites and conditions of growth are fully covered. Recommended that this project be considered administrative and dropped from the investigative program.

Use to be Made of Results:

In reconnaissance and preparation of forest working plans.

Probable Date of Completion:

Indefinite.

Assignment:

C. H. Whitney and local forest forces.

Proposed expenditures:

Fiscal Year 1915-16 - - - - - Nothing.

Project:

Volume, Growth and Yield of Western Yellow Pine, ME-3, D-1.

Object:

To complete the data on volume, growth and yield of this species.

Cooperation.

Office of Silviculture.

Location:

Bitterroot National Forest.

Status:

3000 measurements obtained from western Montana Forests have been compiled; no work done in 1914 since the project was not approved by Central Committee.

Plans for Further Work:

Recommended that this project be dropped from the program as an investigative project and carried simply as administrative work in connection with reconnaissance.

Use to be Made of Results:

In volume tables and in shaping timber sale and planting policies and working plans.

Probable Date of Completion:

Indefinite.

Assignment:

Local force on the Forest under the direction of the District Office.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - (Nothing

Project:

Study of the Causes of Tree Disease and Methods of Prevention and Control, Western White Pine, Pd-2, D-1.

Object:

To describe the fungi which affect western white pine and to determine their prevalence and distribution and best methods of control.

Cooperation:

Bureau of Forest Pathology.

Location:

Forest of the western part of District 1.

Status:

Extensive collections made during 1912, 1913 and 1914 and various diseases studied.

Plans for Further Work:

Work will be continued from year to year until all known diseases of the species have been covered.

Use to be made of Results:

In forest management and publications.

Probable Date of Completion:

Indefinite.

Assignment:

Dr. James R. Weir, Forest Pathologist.

Proposed Expenditures:

Fiscal Year 1915, -16 - - - - - Not known.

Project:

Study of the Causes of Tree Diseases and Methods of Prevention and Control; *Tsuga heterophylla*, *Abies grandis*, *Abies lasiocarpa*, Pd-3, D-1.

Object:

To determine the characteristics of the fungus diseases of these species, reasons for their peculiar association with certain hosts, and methods of forest management that will check their spread and virulence.

Cooperation:

Bureau of Forest Pathology.

Location:

Forest of western part of District 1.

Status:

Field work started in 1911 and continued in 1912, 1913 and 1914 and is now practically complete for the region.

Plans for Further Work:

Compilation of data, laboratory studies, and final preparation and submission of report.

Use to be made of Results:

In forest management and controlling fungus diseases.

Probable Date of Completion:

1915.

Assignment:

Dr. James R. Weir, Forest Pathologist.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - Not known.

Project:

Study of the Causes of Tree Diseases and Methods of Prevention and Control, Western Red Cedar, Pd-4, D-1.

Object:

To describe the characteristics of the fungus diseases of western red cedar and determine their prevalence and distribution and best methods of control.

Cooperation:

Bureau of Forest Pathology.

Location:

Western Forests of District 1.

Status:

Some collections and economic notes have been made in connection with the study of other species; additional progress made in 1914.

Plans for Further Work:

Further collections and technical studies and the taking of stem analyses of diseased trees.

Use to be made of Results:

In forest management and controlling fungus diseases.

Probable Date of Completion:

1915.

Assignment:

Dr. James R. Weir, Forest Pathologist.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - Not known.

Project:

Effect of Different Degrees of Thinning, Mt-1, D-1.

Western White Pine.
Western Yellow Pine.
Lodgepole Pine.
Douglas Fir.
Western Larch.

Object:

To determine the effect of different degrees of thinning in different forest types.

Cooperation:

Location:

Priest River Experiment Station, Coeur d'Alene, Deerlodge and other National Forests.

Status:

Some work with lodgepole begun on the Deerlodge Forest in 1911, the results of which can be incorporated in this project. Location and preliminary examination of four 1/2-acre plots in the 50-year-old white pine larch stand at the Experiment Station was completed in December, 1913.

Thinning operations were completed in the four plots located at the Experiment Station 1913. One plot, containing trees over 12½ feet tall of all species at the rate of 1068 per acre, was left in its natural condition as a check and to furnish data on the result of natural competition on the development of the stand.

One plot was thinned severely, 316 trees per acre over 12½ feet high being left, including only those that it was estimated could persist and develop so as to form part of the final crop in saw logs at maturity.

One plot was thinned to a medium degree, leaving 454 trees over 12½ feet tall per acre, with the intention of making a second thinning in twenty or thirty years removing trees fit for ties and small logs and leaving those which it is expected will participate in the final mature crop.

The fourth plot was thinned lightly, cutting being confined mostly to removal of defective trees and weed species and thinning out of dense groups. Trees taller than 12½ feet left at the rate of 550 trees per acre. Two more thinnings in this plot are planned before the final cutting, the first to be in from 10 to 20 years taking suppressed and defective trees so as to further liberate the remainder and utilize small material; the second additional thinning being in from 30 to

40 years and removing smaller trees down to about 300 per acre including all not expected to form part of the final mature stand.

The stand in which the 1914 series of plots was laid out contained a heavy percentage of western larch, many of which were the largest and best developed trees in the stand. White pine is at present the most valuable species but the majority of the trees of this species present were smaller than the larch. In from 50 to 100 years it is probable that larch will be much more valuable than it is at present, possibly equaling white pine in this respect. For this reason, the best developed, healthiest and most dominant trees were selected in the marking, whether white pine or larch, the pine being given the preference only in cases where it was equal in development and advantageous position to a neighboring larch and where a choice had to be made between the two.

In all cases where an Engelmann spruce was found well placed and healthy, it was left as it is thought that the tolerance of this species makes it desirable in mixture with white pine and larch and its product is valuable.

A heavy understory of western red cedar seedlings and saplings was present. The policy was followed of removing only those which were in the way of cutting or skidding, leaving the balance wherever they happened to be to take advantage of the increased light due to thinning to develop more rapidly, shade the surface and protect soil moisture, help to prune the lower branches of the more intolerant trees and produce a valuable crop of cedar poles at the time the mature crop of logs is obtained.

Numerous hemlock and white fir seedlings and saplings were also present and all specimens of these species were treated as weed trees and removed, down to very small seedlings, regardless of size and position.

Several lodgepole wolf trees had developed, crowding out the more valuable species and all lodgepole was removed because of this tendency toward crowding and because of the small value and short life of the species in the locality concerned.

All trees left in marking were numbered with galvanized iron tags and an individual record taken of height, dbh and length, crown class, development, injury due to thinning operations, etc.

The considerable amount of material removed in the thinning was skidded outside of plots, piled in windrows, and will be burned in the spring of 1915, excepting a part of the larger trunks which were trimmed and piled separately for use in fencing, shed building, etc. A number of these were large enough for small logs. The balance not used for improvement work can be sawed into fire wood.

A preliminary trip was made to the Blackfeet and Deer-lodge Forests for the purpose of locating possible stands in which other series of thinning studies can be located, in the larch and lodgepole types.

Plans for Further Work:

A complete progress report containing all detailed data in regard to the 1914 series of plots will be issued during the coming winter. This series will be re-examined in accordance with the working plan in 1919.

It is planned to initiate some thinning experiments in the lodgepole type on the Deerlodge Forest at the Bernice experimental area sometime in February, 1915.

Thinning plots will also be located in the larch type on either the Blackfeet or Flathead Forests in 1915 if there is opportunity, and new plots will be started at Priest River.

Detailed working plans for the new series of plots to be installed will be prepared as soon as the stands in question have been examined and the procedure determined.

Use to be Made of Results:

In future management of stands in the types concerned.

Probable Date of Completion:

Continuous; changed from indefinite because the study of the effect of thinning will probably always be carried on as long as scientific forestry is practiced and the work being started at this time must continue annually for from 50 to 100 years before final conclusions can be drawn.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Meteorological Study of Forest Types, T-1, D-1.

Western White Pine.
Western Yellow Pine.
Western Larch-Douglas Fir.
Pure Douglas Fir.
Lodgepole Pine.

Object:

To determine the general climatic characteristics of the region and the ecological site differences for the most important types.

Cooperation:

Weather Bureau.

Location:

Priest River Experiment Station.

Status:

Work begun December 1, 1911. Observations have been carried on daily for three years at three permanent stations in the first three types listed. As a check during the growing season, upon the figures obtained from the three permanent stations, four temporary stations were established in the spring of 1914, one in the white pine type, one in the western larch-Douglas Fir type and two in the Western Yellow Pine type.

The two principal factors which seem to determine the presence of growth characteristic of one or other of the three forest types being studied are first, degree of slope and aspect, and second, kind of soil. Thus on the steep northeast-facing slope, where Station I is located, the white pine type is found; across the little valley on the steep southwest-facing slope where Station II is located, is the yellow pine type; at Station III on a flat, sandy bench at the mouth of the valley we find the larch-Douglas fir type; further up the valley on the same flat bench but where the soil is a deep heavy silt, at Station IV, the white pine type is again found; on the steep west and southwest facing slopes at Stations V and VI, the yellow pine type is again present; and at Station VII, on a steep southeast facing slope, further up the valley, conditions which favor the larch-Douglas fir type are again found. There is practically no difference in elevation between the different stations on the various slopes and there is less than 150 feet difference between these slope stations and those on the bench. No two stations

PRIEST RIVER EXPERIMENT STATION

T-1. D-1

are more than $3/4$ mile apart and most of them are very much less than that, three being within $1/8$ of a mile of each other, and all are contained within a small valley about $1/2$ mile wide, as shown on the attached map.

It is probable that all of these seven stations and particularly the three permanent stations are affected by about the same general climatic conditions at any particular time. That is, if it is an unusually hot summer at one, it must also be an unusually hot summer at another; if it is a wet summer at one, it will be a wet summer at all the others; if it is a warm or a cool day at one it is a proportionately warm or cool day at all the others, taking into consideration the difference in slope and aspect.

As far as these stations are concerned, the sole purpose of the study is to establish their climatic inter-relationships in an attempt to determine what meteorological and ecological differences distinguish the sites upon which the three different forest types being studied are found. If these inter-relationships are essentially the same in each of the three consecutive years during which records have been taken, this fact would justify the conclusion that the records obtained would constitute a true and reliable statement of the constant seasonal differences between the stations studied.

It has not been possible as yet to work up the data for three years in complete shape but the figures have been tabulated sufficiently to give good indications of the relationships which will be shown between the different sites. These relationships are more constant for some factors such as temperature, than for other factors such as wind velocity. In order to indicate whether the inter-relationships from season to season were fairly constant, the monthly means for the different readings were computed so as to show the departures from each station from the three-year means for the same month in both amount and percentage. The extremes of variation between any two stations for any month and for any yearly average are shown in the following table:

Factor Recorded	:Greatest Variation from 3-year Mean			
	:Given in Percent of Three-year Mean			
	:In any one year:		:In any one Month:	
	:Percent:	Year	:Percent:	Month
Mean Monthly Maximum Temperature	0.9%	1914	8.7%	Jan-1913
Monthly Mean of Mean Maximum and Mean Minimum temperatures	1.8%	1913	8.0%	Feb-1913
Soil Temperatures at 12 in.	1.46%	1914	5.83%	Nov-1912
Total Monthly Precipitation	1.04%	1913	23.5%	Feb-1912
Mean Monthly Wind Velocity	12.1%	1912	29.4%	Sept-1912

In general the variations in percentage of the three year mean run quite uniformly but an occasional break gives a fairly high individual variation in some months. In the yearly averages of percentage of variation there are very slight differences as the above table indicates.

There are strong indications from tabulations made so far that we shall be warranted in closing the study this year but until the data is completely worked up a definite conclusion as to whether the work should be continued or closed cannot be made.

Plans for Further Work:

Working up of the data for three years will be completed during the coming winter and a report prepared and submitted for a decision as to whether the study should be conducted for an additional period. One permanent station will always be maintained for obtaining climatic data.

Use to be Made of Results:

In forestation, silvical studies, land classification and fire control.

Probable Date of Completion:

Continuous for one station for the purpose of obtaining data on climate; 1914 or 1915 for the restricted study of types by means of the present three stations.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Methods of Cutting, Mc-1, D-1.

Object:

To ascertain the best silvicultural systems of cutting by actual test of them in timber sale operations and by studies of cut-over areas.

Cooperation:

Local Forest Officers on the Forests concerned.

Location:

National Forests of Northern Idaho and Western Montana.

Status:

Work was begun in 1912 by the study of cut-over areas in the white pine type; this was continued in 1913 by the study of 30 areas in the same type. Important information was obtained on seed distribution of white pine and associate species and on survival of seedlings under different conditions. Evidence was found to support the theory that white pine seed was capable of lying over in the soil and duff for several years after ripening and of finally germinating upon the introduction of greater heat and more light to the surface by cutting operations. This evidence has led to a radical change in marking rules and methods of brush disposal in the white pine type.

Work on this project in 1914 consisted of a week's trip of observation in the western larch type on the Blackfeet Forest for the purpose of planning intensive work in that type; a week's trip on the Cœur d'Alene Forest in September during which time a permanent sample plot of one acre was established by intensive methods on a five-year-old selection cutting in white pine type; a week's trip in October over parts of the Deerledge Forest for the purpose of planning experiments and permanent sample plots for the study of methods of cutting in the Lodgepole type; and the collection and careful extraction of 7 pounds of fresh white pine seed, most of which was placed in 270 different rodent proof wire baskets and arranged so as to show the length of life of white pine seed when placed on or under the duff of the Forest floor at different depths and under different conditions of light and heat. Three series of 90 baskets, each containing 500 seed, with the seed placed at 9 different depths ranging from surface to 2 inches, one basket of each depth to be taken up each year for 10 years and germinated, were so placed that one series was under the heavy shade of a mature stand, one series was under the light shade of a partially thinned stand and one series was entirely in an open clearing on a cut-over area. Seed was thoroughly mixed and a

typical sample taken from a long time germination test in the greenhouse and in the nursery. Work was partially completed on the preparation of a detailed progress report on the 1912 and 1913 study of cut-over areas in the white pine type.

Plans for Further Work:

Progress report on the 1912 and 1913 work will be issued in the winter of 1914-15. Germination tests of the seed used in the longevity experiment will be made in 1914-15 and each of the following winters for ten years, after which a progress report will be issued on that phase of the project, with partial reports in the meantime. A considerable part of the summer of 1915 will be spent by a crew of two or three men in laying out permanent sample plots in the white pine, Douglas fir-larch, and lodgepole types; also in establishing complete experiments in methods of cutting on actual timber sale operations including an examination previous to cutting, a record of the marking done, and periodic examinations of results secured. Work will be carried on largely on Coeur d'Alene, Blackfoot and Flathead Forests with the co-operation of the local Forest Officers. It is felt that during the coming summer particular stress should be laid on the study of the Douglas fir-larch type on the Blackfoot and Flathead and Kootenai Forests. Sufficient information has already been obtained on cutting in the white pine type to serve as a good temporary guide while definite facts in regard to the larch-fir type are at present very meager and incomplete. The annual cut in this type is almost as great as in the white pine type and the silvicultural practice is greatly in need of further study. Active work on the preparation of the Larch Tree Study will be started in 1915 and the study of methods of cutting should be started in order to provide information needed in the preparation of the Tree Study monograph as well as for immediate application on numerous active sales.

The working plan for this project will be amended and brought up to date so as to include the details of all the new work outlined in this section, in time for approval before the season's work for 1915 is started.

Date of Completion:

Indefinite.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Factors Effecting Natural Reproduction, Mr-1, D-1.

Western White Pine and Associate Species.

Object:

To determine amount of and causes for loss of seedlings and persistence and vigor of others in stands of all ages and degrees of density.

Cooperation:

Location:

Priest River Experiment Station and Coeur d'Alene Forest.

Status:

Began in 1912; chart plots re-examined in 1913. Sixty small plots were conducted under carefully controlled conditions on three sites to study germination and survival of white pine, western yellow pine, Douglas fir, western larch, western red cedar and western hemlock under various conditions of shade and ground surface; interesting information was obtained from the first year's observations.

In 1914 circumstances prevented re-examination of the chart plots but this will be done early in the spring of 1915 and the same results obtained as in the fall of 1914.

Counts of the second year's germination and survival on the 60 small plots were made monthly during 1914. The data obtained has not been completely worked up but some of the indications are interesting. Almost as much or more germination of the spring sown white pine and larch occurred the second season as the first. The hot dry period of seven weeks was a very severe test of vitality and on the exposed sites practically all new germination died while on protected sites survival was high.

Plans for Further Work:

The data obtained from the 1913 and 1914 work will be worked up and a progress report prepared during the coming year. A working plan for further work in this project will be prepared for approval.

Use to be Made of Results:

In handling timber sales.

Probable Date of Completion:

1920.

Assignment:

Officer in Charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$ _____

Project:

Western White Pine Tree Study, TS-1, D-1.

Object:

To secure all of the available information on the characteristics, distribution, growth, yield, management, and uses of this species.

Cooperation:

Location:

Clearwater, St. Joe, Kaniksu, and Coeur d'Alene National Forests, and Priest River Experiment Station.

Status:

Work begun in 1911. Studies made on reproduction, seedling growth, windfall and utilization. Field work largely completed in 1913 and first draft of text prepared.

In 1914 the text was rounded out and strengthened by some additional field observations, and by a reconsideration and recompilation of the data on hand.

The final draft of the various portions of the original text will be completed sometime in December, 1914, and the entire report on the study covering the silvicultural phases will be submitted early in 1915.

Plans for Further Work:

Compilation of tables for appendix will take a few weeks, otherwise the work is complete.

Use to be made of Results:

Bulletin.

Probable Date of Completion:

1914.

Assignment:

F. I. Rockwell.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - Nothing.

Project:

Western Larch Tree Study, TS-2, D-1.

Object:

To secure all of the available information on the characteristics, distribution, growth, yield, management, and uses of this species.

Cooperation:

Location:

Kootenai, Missoula, Lolo, St. Joe, Kaniksu, Blackfeet, and Flathead National Forests.

Status:

Work incidental to other projects was begun in 1911. Several hundred tree measurements collected. Some yield data secured.

No work on this project has been done in 1914 except the preparation of a preliminary outline of procedure. It was decided that the best way to pursue the work would be to prepare a preliminary report giving a thorough resume' of the information on this species which is already on hand, after which a detailed working plan giving the additional information needed and plans for securing it could be prepared and the work pursued as soon as funds are available.

Plans for Further Work:

During the winter of 1914-15, the man to whom this project is assigned will be able to devote enough time to it to prepare the preliminary report on information now on hand. It is felt that the project is an important one and should be pushed in 1915 and, if funds are available, a working plan based on the preliminary report and giving the lines along which further work is needed will be prepared and field work started.

Use to be made of Results:

Bulletin.

Probable Date of Completion:

Indefinite; changed from 1916 because the extent of the work needed is still so indefinite as to make it impossible to forecast when the project can be completed until

the work has been well started and some knowledge is gained as to the scope of the problem and the best means of studying it.

Assignment:

A. O. Benson.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - \$1700.00

Project:

Intensive Development of the Priest River Experiment Station Territory (Administrative Project No. 1, D-1)

Object:

To work out on a small and intensive scale on the Benton Creek and South Fork of East River watersheds as many as possible of the silvicultural, improvement, and fire protective problems encountered in the administration of the north Idaho Forests of which these watersheds are typical.

Cooperation:

Location:

Priest River Experiment Station.

Status:

By reason of the Idaho State Land Exchange which was arranged in 1913, an area of 4,250 acres comprising practically all of Benton Creek and the lower half of the South Fork of East River watersheds was left in the vicinity of the Experiment Station for the use of the Station in establishing experiments, isolated from the rest of the Kaniksu Forest. These watersheds, although small, furnish a wide variety of sites, age classes, types and other conditions, and are typical of the many larger watersheds which are units of management on the Kaniksu and neighboring Forests. The plan of giving the Experiment Station the entire administration of this tract was proposed in 1913 and since that time all timber sales, improvement, reconnaissance and other work of a similar nature has been handled directly by the Station force. Four small sales were made to neighboring ranchers in the winter of 1913-14 in cleaning up dead and fire-killed timber. In that winter and in November and December, 1914, the reconnaissance of all but two sections has been completed on a very intensive scale, obtaining a 20 percent estimate with 1/10 acre sample plots taken in each type to give the mixture of species of all sizes, mapping and topography done with Abney level with contours at 20-foot intervals and on a scale of eight inches per mile.

In the summer of 1914, two miles of new trail were built, a six and one-half mile telephone line was constructed to a lookout point on the range above the area, and a three and one-half mile road up Benton Creek to within one-half mile of its source was partly constructed; the entire length was slashed road width and a trail tread was graded on about two and one-half miles of it.

During the exceptionally dangerous fire season of 1914 a fire patrol was maintained at the lookout point and a special and complete equipment of fire-fighting tools, cooking outfit, and non-perishable provisions for a ten-man crew was purchased to be kept on hand for emergencies.

Plans for Further Work:

From January to March, 1914, it is planned to assign several Rangers from the North Idaho Forests, who can be spared at that time of year, together with one of the Supervisors, to the Station for the purpose of helping develop the Station territory and at the same time gain practical experience and instruction in silvicultural and improvement work. During this assignment, it is planned to clear ground for a building site on which a permanent set of buildings can be erected if it is decided to make the assignment an annual affair. If the plan is given up, this cleared ground will be useful in other ways. If the plan is approved, steps will be taken during the coming year to secure the use of a portable sawmill and the lumber will be sawed and stacked for drying during the second winter. Lumber can be planed and the buildings erected during the third winter.

Other work which it will be possible to use these men on during their assignment to the mutual benefit of themselves and the Station will be the laying out and construction of trails and roads, installation of various kinds of experimental plots for the study of thinnings, reproduction, methods of cutting, brush disposal and other silvicultural problems, construction of experimental fire lines and other work of a similar nature which will help to place the territory under a system of ideal forest management.

A forest working plan will be prepared as soon as the reconnaissance is completed covering the silvicultural management of the tract and this will be used as the basis for the further work to be done. Reconnaissance of the remaining two sections is already started, the control having been run and the estimating and mapping of one-eighth of one section being completed. This will be finished sometime in the spring or fall of 1915 and compilation of data for the working plan will be undertaken whenever opportunity offers.

- It is felt that, from a broad standpoint, the management of this tract will constitute in the long run the most valuable and far-reaching experiment that it is possible for the Station to carry on and that the data obtained from the intensive management of this area will be of great value. It is further felt that the expenditure of a minor part of the time of the Experiment Station force upon the development of this area is fully justified by the investigative results to be secured and that this development work should be carried on hand in hand with the strictly investigative projects in

the program.

The expenditure on this territory of an appreciable amount of Improvement and General Expense money from the District Appropriation is considered desirable from the standpoint of the investigative data to be secured in the course of working out various problems, because of the value in the way of instruction which can be given to Rangers assigned to the development work, and also from the standpoint of the publicity which can be given to the work of the Forest Service by the intensive development of a small accessible tract of this character which is on one of the main traveled routes of summer tourists, is close to Spokane and other population centers and can be made very attractive as a recreation ground for fishing, hunting, mountain climbing and sight-seeing.

In line with this policy, it is planned to continue the work of building roads and trails during 1915 for making the area more accessible and for better fire protection. This money will be spent during July and August so that the Improvement crew can be utilized as a fire-fighting organization when necessary. The best possible fire protection of such an area is of first importance and no chances should be taken of possible loss after valuable experiments have been started.

Use to be made of Results:

Administration of the western Forests of District 1.

Probable Date of Completion:

Continuous.

Assignment:

Officer in charge of Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16,	Improvements - - -	\$1000.00
	Fire protection---	300.00
	Reconnaissance --	Not possible to estimate.

Project:

Intensive Development of the Bernice Experimental Area on the Deerlodge Forest, Administrative Project No. 2, D-1.

Object:

To work out on an intensive scale on the headwaters of the Boulder River watershed in the vicinity of Bernice, Montana, as many as possible of the silvicultural, grazing and fire protective problems encountered in the administration of the Forests of central and Eastern Montana of which the conditions on this watershed are more or less typical.

Cooperation:

Deerlodge National Forest.

Location:

Bernice Ranger District, Deerlodge National Forest.

Status:

This project was first proposed in 1914 and the only work done has been a preliminary trip to the area by several men during the fall for the purpose of determining the possibility of undertaking the project and conducting a nursery in connection with the proposed forestation experiments.

The area is particularly suited to the work proposed. The timber is mostly lodgepole pine, the important timber of most of the central and eastern Montana Forests, and there are a great variety of age-classes, densities and conditions available for study within a compact and very accessible area. Timber cutting has been going on for thirty years or more, mostly in the form of rough thinnings, taking out only certain classes of the trees such as those suitable for lumber, for ties, for fence poles, house logs, etc. Thus a variety of old cuttings are available for study. For several years Forest Service sales of timber for use in the mining industry of Butte and Anaconda have been conducted using various degrees of selection marking for material of different sizes. These cuttings offer many opportunities for the establishment of permanent sample plots for the study of increased growth after thinning, effect of opening the stand on reproduction, and other silvicultural problems coming up in connection with the management of lodgepole pine stands.

Reforestation of the Montana Forests can be studied to advantage on the various available planting sites and a nursery can be conducted for raising stock.

Plans for Further Work:

It is planned to induce the Anaconda Copper Mining Company to guarantee to take a certain annual cut of timber from the area, say a million feet, which will give steady year-long support to a small community of picked choppers and woods workers who will be dependent upon the Forest unit for their living. Some dependable local man can be practically guaranteed a good profit for agreeing to take care of the hauling and of handling the men in the woods by the subcontracting system. Utilization of material in the form of stulls, converter poles, lagging, and charcoal is so complete that very intensive management is possible in connection with the regular timber sale business. This will make possible the installation of a wide range of experiments on increased growth due to thinning, different methods of brush disposal, and effect of different methods of cutting upon reproduction as an integral part of the sale and cutting of timber. The only cost of installing these experiments will be the expense of laying off the plots and of maintaining the observations for the necessary length of time.

It is planned to make an intensive reconnaissance of the timbered portions of the area which will be suitable for experiments and for inclusion in the forest working plan. The tract will then be considered a complete working circle and a plan based on the reconnaissance will be prepared for intensive management and development.

The cutting of timber will be based on a sustained annual yield and this yield will be brought to its maximum as soon as possible by the practice of good silviculture and by the filling of all fail places and open sites by planting. The results obtained by the management of this area will be of great investigative value in the sense that they will be a guide to what can and should be done with the other watersheds of the neighboring Forests when opportunities for the sale and utilization of the product are as good as they are on the Bernice Area.

In connection with the management of this area as with the Priest River Experiment Station territory, there will be an opportunity to assign Rangers from the central and eastern Montana Forests for short periods during the slack seasons for the purpose of helping with investigative work in connection with the project.

This project is considered administrative in the sense that it will involve the application on a large and complete scale of the information brought out by the experiments on individual investigative projects which will be conducted on the area and which have been mentioned in the reports on the different projects.

Use to be Made of Results:

In the management of the central and eastern Montana Forests.

Probable Date of Completion:

Continuous.

Assignment:

Local force on the Deerlodge Forest, District Office, and Priest River Experiment Station.

Proposed Expenditures:

Fiscal Year 1915-16 - - - - - No investigative funds except as listed under different investigative projects.

Project:

Methods of Brush Disposal, Lodgepole Pine, D-1.

Object:

To determine the best and cheapest method of brush disposal in lodgepole pine stands, taking into consideration reproduction, fire risk and effect of grazing.

Cooperation:

Local Forest officers on the Deerlodge Forest.

Location:

Deerlodge National Forest, Bernice District.

Status:

General plan approved by D-1 Investigative committee.

Plans for Further Work:

If project approved by central committee, plan to start work field season 1915.

Date of Completion:

Active work to be completed summer of 1917. Observations to be continued for several years afterwards.

Assignment:

Officer in charge of Priest River Experiment Station assisted by local Forest officers, Deerlodge.

Proposed Expenditures:

Fiscal Year 1916.

Fencing, about \$150.00

Fiscal Year 1917, Fire control, \$50.00